Otway Exploration Drilling Program

Environment Plan

ABU2-000-EN-V01-D-00008

Revision Detail

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001	22/02/2024

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1. Introduction

ConocoPhillips Australia is proposing to undertake exploration activities in offshore permits VIC/P79 and T/49P located in Commonwealth waters off the Otway Basin. The proposed Otway Exploration Drilling Program (the exploration program, or activity) is a continuation of ConocoPhillips Australia's exploration program in the offshore Otway Basin which aims to identify commercially viable natural gas reserves to help meet Australia's energy needs.

While ConocoPhillips Australia, as titleholder, has the exclusive right to undertake activities within the offshore area of their title, the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (the Environment Regulations) require that an accepted Environment Plan (EP) be in force before commencing any such activities.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is the independent statutory authority that regulates all petroleum and greenhouse gas storage activities in offshore areas. NOPSEMAs acceptance of this EP will provide the authorisation necessary for the activity to commence. On acceptance, the EP forms legally binding requirements by which ConocoPhillips Australia must undertake the Otway Exploration Drilling Program.

1.1. ConocoPhillips Australia

ConocoPhillips Australia was established almost two decades ago. Headquartered in Brisbane, Queensland, we are a 47.5 percent shareholder in Australia Pacific LNG (APLNG) and operate the APLNG facility on Curtis Island. We are also the major joint venture partner in offshore petroleum titles VIC/P79 and T/49P in the Otway Basin, holding 80% interest and operatorship of both permits. ConocoPhillips Australia is a subsidiary company of ConocoPhillips Company (United States entity).

Globally we have more than 50 years of offshore experience and have conducted offshore operations in the North Sea (United Kingdom and Norway), Barents Sea (Norway), Baffin Bay (Greenland) and between northern Australia and Timor Leste.

Further information about ConocoPhillips Australia is available at: www.conocophillips.com.au, and information about ConocoPhillips Company is available at: www.conocophillips.com.

1.1.1. Details of Titleholder and Liaison Person

In accordance with section 23(1)(2) of the Environment Regulations, details of the titleholders and liaison person for this EP are provided in Table 1-1 below.

Table 1-1: Details of titleholders and liaison person

Details	Titleholder	
	T/49P	VIC/P79
Name	ConocoPhillips Australia SH1 Pty Ltd	ConocoPhillips Australia SH2 Pty Ltd
Business Address	Level 1, 33 Park Road, Milton, QLD 4064	Level 1, 33 Park Road, Milton, QLD 4064
Telephone Number	Phone: 07 3182 7122	Phone: 07 3182 7122
Email Address	Otway@conocophillips.com	Otway@conocophillips.com
ABN	18 116 771 450	24 141 253 769
Nominated Liaison Person		
Name	Aaron Burt - Exploration Manager, ConocoPhillips Australia	
Business Address	Level 1, 33 Park Road, Milton, QLD 4064	
Telephone	07 3182 7122	
Email	Otway@conocophillips.com	

In accordance with Section 23(3) of the Environment Regulations, ConocoPhillips Australia will notify NOPSEMA of any change in titleholder, a change in the titleholder's nominated liaison person, or a change in the contact details for either the titleholder or the liaison person as soon as practicable after such a change takes place during the proposed activity.

1.2. Environment Plan Summary

As required by section 35(7) of the Environment Regulations, a summary of the material requirements of this EP and links to where detailed information is provided in the EP are outlined in Table 1-2.

Table 1-2: EP Summary of material requirements

EP Summary Material Requirements	Relevant Section of EP containing EP Summary Materials
Details of the titleholders nominated liaison person for the activity	Section Table 1-1
The location of the activity	Figure 1-1 and Section 2.1
A description of the activity	Section 2
A description of the receiving environment	Section 4
Details of the environmental impacts and risks	Sections 6, 7 and 8
The control measures for the activity	Sections 6, 7, 8 and 9
The arrangements for ongoing monitoring of the titleholder's environmental performance	Sections 9 and 10
Response arrangements in the oil pollution emergency plan (OPEP)	Refer to OPEP (Appendix I)
Consultation already undertaken and plans for ongoing consultation	Sections 3 and 10

1.3. Purpose of the Environment Plan

The objectives of the Environment Regulations are to ensure that any petroleum activity carried out in an offshore area is conducted in a manner consistent with the principles of ecologically sustainable development (ESD), as set out in section 3A of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Additionally, these activities must be carried out in a manner that reduces the environmental impacts and risks associated with them to as low as reasonably practicable (ALARP), while also ensuring that any remaining environmental impacts and risks are at an acceptable level.

The overarching purpose of this EP (this document) is to demonstrate that ConocoPhillips Australia's proposed Otway Exploration Drilling Program can meet the objectives of the Environment Regulations.

The EP contains information to meet the content requirements defined in Division 2 of the Environment Regulations and to demonstrate that the criteria of acceptance of an EP can be met, as defined by section 34 of the Environment Regulations. Environmental assessment processes have been systematically followed and applied thoroughly to ensure that:

- The activity is clearly scoped and bounded and the environment that may be affected is suitably understood
- The legislative and other requirements that apply to the activity will be met
- The impacts and risks are suitably understood based on detailed analysis of how the activity and environment interact
- Acceptable levels of environmental impact and risk have been defined and justified
- Environmental impact and risk levels have been predicted and compared to the defined acceptable levels of impact such that information uncertainties can be identified
- Control measures for treating environmental impacts and risks will be effective

- Additional and alternative control measures and improved environmental performance have been considered and adopted where costs are not grossly disproportionate to their predicted environmental benefit
- Environmental performance can be easily monitored and is clearly connected to the control measures and the management of predicted levels of impact or risk
- Appropriate action has been taken in the presence of scientific uncertainty, and
- The outcomes of the assessments are defensible and reproducible.

ConocoPhillips Australia's environmental impact and risk assessment methodology, described in detail in Section 5, provides a structured process for identifying, assessing and managing environmental impacts and risks associated with an offshore petroleum activity. The methodology has been designed to align with AS/NZS ISO 31000:2018: Risk Management – Principles and Guidelines, and the requirements of the Environment Regulations.

The Implementation Strategy for the EP, described in detail in Section 10, provides a systematic framework to ensure that exploration activities are conducted in accordance with the outcomes and requirements of the environmental assessment process. The Strategy describes the environmental management system in place for the activity to ensure impacts and risks are continuously identified and reduced to levels that are ALARP. In addition, the Implementation Strategy and supporting Oil Pollution Emergency Plan (OPEP) include details on the response arrangements and systems in place to manage oil pollution risks.

The EP includes a description of the consultation process undertaken in preparation of the EP (Section 3), during which relevant persons were identified and engaged with to inform the values and sensitivities of the environment, the evaluation of impact and risks, and the environmental management of the activity. The consultation process is described in Section 3 and consultation reports are included in Appendix C – Consultation Report and Appendix D – Sensitive Information Report. The EP shows how consultation feedback has been incorporated throughout the environmental assessment process, including the adoption of appropriate measures arising from consultation.

1.4. Scope of this Environment Plan

ConocoPhillips Australia is proposing to undertake exploration activities within Operational Areas associated with offshore petroleum titles VIC/P79 and T/49P, located in Commonwealth waters offshore of Victoria and King Island, Tasmania.

The scope of this EP covers the activities described in Section 2 inclusive of those undertaken during potential emergency conditions. The exploration program involves initially completing seabed surveys over a maximum of nine locations, which will commence no earlier than 1 April 2024 subject to relevant approvals being in place. Drilling commencement is also dependent on regulatory approval, and rig availability, and will commence no earlier than 1 October 2024. The term of the approval for these activities is proposed to continue until 31 December 2028, to allow for the drilling of a maximum of six exploration wells and to account for rig availability.

During consultation, ConocoPhillips Australia received feedback regarding the lack of specific drilling locations making it difficult to assess the possible consequences of the proposed Otway Exploration Drilling Program on functions interest and activities (Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3785, FB ID: 371, 372; Org ID 524, Wilderness Society, Event ID: 3480, FB ID: 385; Org ID: 593, Event ID: 3134, FB ID: 266; Org ID 593, Event ID: 3133, FB ID: 257; Org ID: 50, Tasmanian Seafood Industry Council (TSIC), Event ID: 1821, FB ID: 151, 153; Org ID: 528, Australian Oceanographic Services Pty Ltd, Event ID: 1239, FB ID: 64; Org ID: 528, Australian Oceanographic Services Pty Ltd, Event ID: 720, FB ID: 17; Document ID: 3923). ConocoPhillips Australia commenced consultation in support of the preparation of the EP in February 2023, recognising that an extended duration for consultation would provide greater opportunity to receive feedback from relevant persons and organisations that could influence the activity design and/or the environmental management of the activity.

ConocoPhillips Australia has undertaken to refine the operational areas as soon as possible during the consultations (Project Update August 2023) and provided guidance to relevant persons who provided this feedback, as follows:

- Specific locations for seabed surveys and exploration drilling have yet to be confirmed. The process for selecting final survey and drilling locations involves the completion of seismic data processing, interpretation of the data to select targets with a high probability of success, and analysis of the efficiency of the drilling program to confirm resources with the least amount of wells, to minimise potential impacts and risks associated with each.
- Consequently, ConocoPhillips Australia has undertaken to assess the environmental impacts and risks associated with seabed surveys and drilling activities that may occur anywhere within broader operational areas associated with petroleum titles VIC/P79 and T/49P. This ensures that the impacts and risks associated with all potential survey and drilling locations are assessed. It is recognised that this may result in an overestimation of impacts and risks. However, a precautionary approach is being taken that assesses worst-case impacts and applies appropriate control measures across the board to minimise impacts and risks to acceptable levels that are as low as reasonably practicable.
- Presenting the full extent of ConocoPhillips Australia's proposed activities allows for the full consideration of impacts and risks across the broadest possible spatial and temporal extents on one occasion is considered preferable and aims to reduce consultation burden when compared to the alternative of developing multiple environment plans for a reduced number of specific drilling locations, without consideration of feedback from consultation or disclosure of the full extent of the proposed Otway Exploration Drilling Program (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 376, 378; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3785, FB ID: 374).

The operational areas for the exploration program are defined as 'the areas within which petroleum activities may occur' (Section 2.1.1). Water depths in these areas range from approximately 53 m to 500 m.

The scope of this EP does not include:

- Vessels transiting to or from the operational areas. The vessels are deemed to be operating under the Commonwealth Navigation Act 2012 and not performing a petroleum activity whilst outside the operational areas.
- Mobilisation of the mobile offshore drilling unit (MODU or drilling rig) into Australian Commonwealth waters and Victorian State waters, and associated biosecurity and ballast water management prior to the arrival of the MODU into the operational areas. The MODU is subject to biosecurity control on entering Australian territory (12 nm offshore) in accordance with the Biosecurity Act 2015. Ballast water must be managed in accordance with the Australian Ballast Water Management Requirements Rev 8. Both biosecurity and ballast water management are administered by the Commonwealth Department of Agriculture, Water and Environment (DAWE).
- Development of a commercial project and associated production wells, which are contingent on the discovery of commercially viable quantities of hydrocarbons during the exploration phase. Separate approvals and further consultation would be required to support the development of a commercial project with permanent operating infrastructure. [Point added in response to Matter: I26].
- Marine seismic surveys. However, as described in Section 2.2.4 (Well Formation Evaluation) certain short-term, temporary activities, often misinterpreted as seismic surveys, are included within the scope of the Otway Exploration Drilling Program including downhole formation evaluation tool Vertical Seismic Profiling (VSP). Impacts associated with this activity are described in Section 6.7 (Underwater Sound Emissions – Impulsive). [Point added in response to Matter: F01, I26].

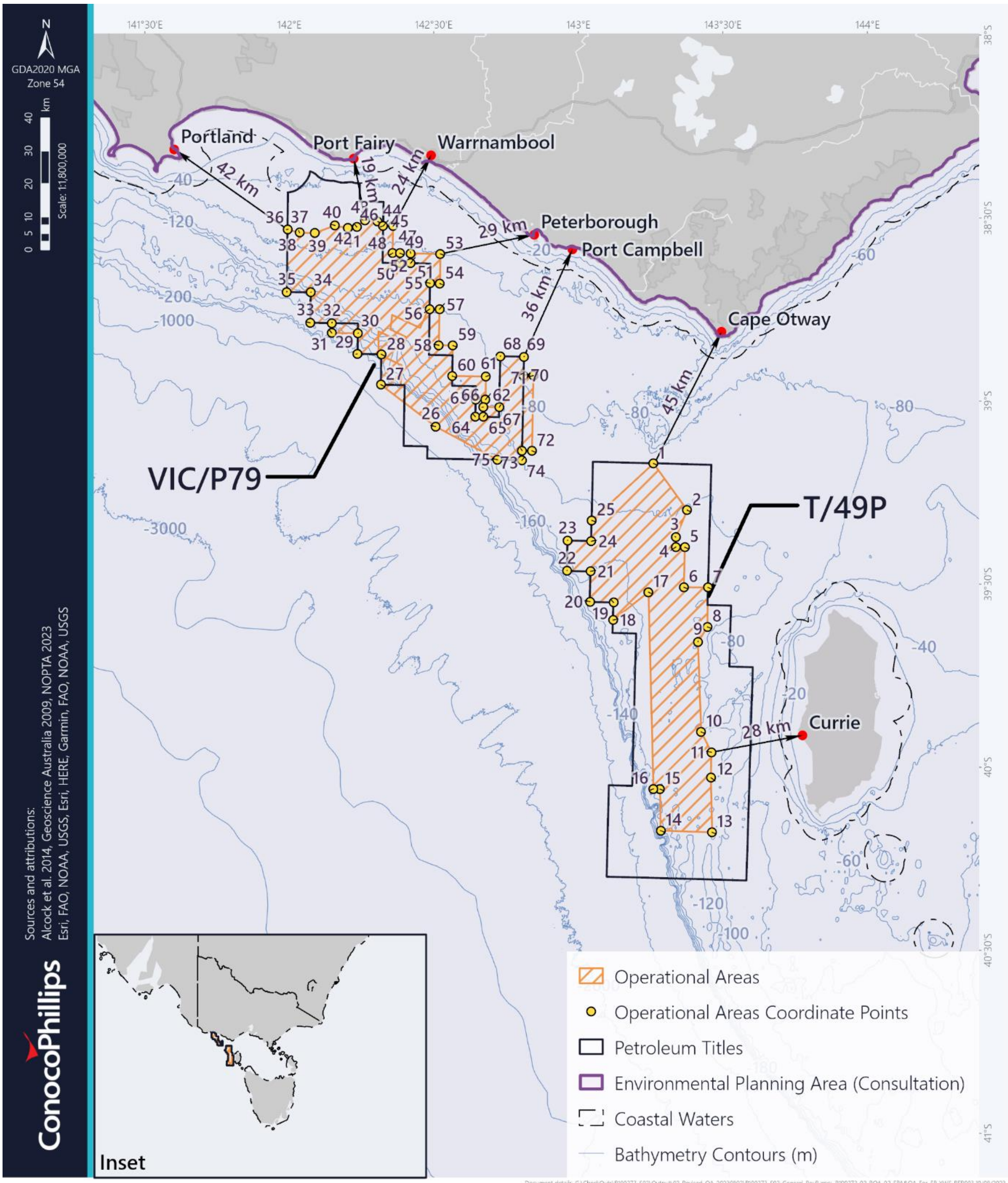


Figure 1-1: Location of petroleum titles T/49P and VIC/P79 and operational areas

Coordinates

Label	Latitude (DDM)	Longitude (DDM)
1	39° 11.942868' S	143° 17.870276' E
2	39° 19.452207' S	143° 25.232151' E
3	39° 23.954094' S	143° 23.005317' E
4	39° 25.544333' S	143° 23.047592' E
5	39° 25.556888' S	143° 24.940287' E
6	39° 32.112696' S	143° 24.957322' E
7	39° 32.036884' S	143° 30.080953' E
8	39° 38.511455' S	143° 30.208905' E
9	39° 41.015225' S	143° 28.273631' E
10	39° 55.766188' S	143° 29.500828' E
11	39° 59.047894' S	143° 31.79181' E
12	40° 3.225151' S	143° 31.850275' E
13	40° 12.177574' S	143° 32.425803' E
14	40° 12.117504' S	143° 21.414201' E
15	40° 5.332475' S	143° 21.02598' E
16	40° 5.317236' S	143° 19.642539' E
17	39° 33.065567' S	143° 17.494065' E
18	39° 37.787731' S	143° 10.139134' E
19	39° 34.888459' S	143° 10.129765' E
20	39° 34.864304' S	143° 5.132129' E
21	39° 29.887356' S	143° 5.131516' E
22	39° 29.891242' S	143° 0.130618' E
23	39° 24.948193' S	143° 0.124462' E
24	39° 24.947305' S	143° 5.119722' E
25	39° 21.531633' S	143° 5.122467' E

Label	Latitude (DDM)	Longitude (DDM)
26	39° 6.625669' S	142° 31.731013' E
27	38° 59.911817' S	142° 20.082382' E
28	38° 54.910972' S	142° 20.082627' E
29	38° 54.911842' S	142° 15.082341' E
30	38° 51.532672' S	142° 15.099903' E
31	38° 51.532931' S	142° 9.630396' E
32	38° 49.913611' S	142° 9.635697' E
33	38° 49.911898' S	142° 5.082357' E
34	38° 44.911033' S	142° 5.082576' E
35	38° 44.911085' S	142° 0.082634' E
36	38° 34.634708' S	142° 0.082378' E
37	38° 34.63893' S	142° 0.111735' E
38	38° 35.133234' S	142° 2.604834' E
39	38° 35.160424' S	142° 5.821354' E
40	38° 33.879794' S	142° 10.004567' E
41	38° 34.296033' S	142° 12.722788' E
42	38° 34.080533' S	142° 14.557198' E
43	38° 32.964096' S	142° 16.237201' E
44	38° 33.122503' S	142° 18.888924' E
45	38° 33.855446' S	142° 20.081528' E
46	38° 33.855721' S	142° 20.081974' E
47	38° 33.85662' S	142° 22.147729' E
48	38° 38.288879' S	142° 22.150006' E
49	38° 38.288847' S	142° 23.674805' E
50	38° 39.910702' S	142° 23.686989' E

Label	Latitude (DDM)	Longitude (DDM)
51	38° 39.910698' S	142° 25.946003' E
52	38° 38.288867' S	142° 25.945276' E
53	38° 38.288453' S	142° 32.149722' E
54	38° 43.151128' S	142° 32.152191' E
55	38° 43.150951' S	142° 30.082072' E
56	38° 47.376154' S	142° 30.082194' E
57	38° 47.373979' S	142° 32.154344' E
58	38° 53.289081' S	142° 32.157397' E
59	38° 53.289058' S	142° 35.080919' E
60	38° 58.304081' S	142° 35.082044' E
61	38° 58.288721' S	142° 42.159693' E
62	39° 2.062281' S	142° 42.161638' E
63	39° 2.067572' S	142° 40.082457' E
64	39° 4.910809' S	142° 40.08254' E
65	39° 4.910789' S	142° 41.783615' E
66	39° 3.291066' S	142° 41.776556' E
67	39° 3.281544' S	142° 45.082389' E
68	38° 54.910601' S	142° 45.082123' E
69	38° 54.91052' S	142° 50.082021' E
70	38° 57.979071' S	142° 50.0821' E
71	38° 57.970856' S	142° 52.159172' E
72	39° 10.314739' S	142° 52.16565' E
73	39° 10.3231' S	142° 50.082536' E
74	39° 11.910767' S	142° 50.082591' E
75	39° 11.911623' S	142° 44.928205' E

1.5. Environmental Impact and Risk Assessment Methodology

Section 21(5) of the Environment Regulations requires the EP to detail all environmental impacts and risks from the activity, evaluate them, and detail control measures to reduce the impacts and risks of the activity to as low as reasonably practicable (ALARP) and acceptable levels. NOPSEMA's Environment Plan Content Requirements guidance note (N-04750-GN1344, September 2020) describes the considerations to be made when undertaking evaluation and treatment of impacts and risks.

The ConocoPhillips Australia environmental impact and risk assessment methodology provides a structured and comprehensive process for identifying, assessing and managing environmental impacts and risks associated with an offshore petroleum activity. The methodology meets the requirements of the Environment Regulations and is consistent with Australian and New Zealand Standards for risk management and environmental management systems, offshore oil and gas industry guidance on risk-related decision making and NOPSEMA Guidelines and Guidance Notes.

Full details of the methodology and how it has been applied during the development of this EP is provided in Section 5.

During community information sessions, ConocoPhillips Australia received feedback that the Victorian and Tasmanian coastlines are critical habitat for many marine fauna, especially whales; and any impact to these animals would be unacceptable (Document ID: 3923). Conservation plans (conservation management plans, recovery plans, conservation advice) published by the Department of Climate Change, Energy, the Environment, and Water (DCCEEW) allow for some level of impact, typically behavioural responses.

In addition, exploration activities do not operate to a no-impact standard. Instead, ConocoPhillips Australia is required to define the acceptable level of impact and work below that level. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. ConocoPhillips Australia utilises this information to make predictions of the levels of impact expected to occur and compares that to the previously defined acceptable levels. This assessment is then scrutinised by NOPSEMA who determine if the EP demonstrates that the environmental impacts and risks of the activity will be of an acceptable level and that the EP meets the requirements of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023.

1.6. Legislative Framework

The identification of legislative and other environmental requirements that apply to the Otway Exploration Drilling Program provides important context for the evaluation of environmental impacts and risks. ConocoPhillips Australia is required to have regard for all relevant context when defining the acceptable level of impacts and risks, including (among other things) laws, policies, standards, conventions, statutory instruments such as recovery plans for threatened species and plans of management for protected places.

Predictions of environmental impact and risk must be made with legislative and other requirements in place as they represent the minimum level of environmental management required. Control measures are then implemented to ensure that these requirements are complied with.

Currently identified ‘legislative and other environmental requirements’ have been collated and are provided in Appendix A, along with an explanation of how these relate to the proposed exploration activities.

1.6.1. Commonwealth Legislation

The primary legislation governing the exploration project is the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) and the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (the Environment Regulations).

The OPGGS Act provides the regulatory framework for all offshore exploration and production activities in Commonwealth waters (those areas beyond three nautical miles from the Territorial Sea baseline and with the Commonwealth Petroleum Jurisdiction Boundary). The Environment Regulations have been made under the auspices of the OPGGS Act for the purposes of ensuring (as described in section 3) that any petroleum activity or greenhouse gas activity carried out in an offshore area is:

- Carried out in a manner consistent with the principles of ecologically sustainable development set out in section 3A of the EPBC Act; and
- Carried out in a manner by which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable; and
- Carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level”.

This EP meets the requirements of the Environment Regulations by providing a plan that:

- Is appropriate for the nature and scale of the activity
- Demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable (ALARP)
- Demonstrates that the environmental impacts and risks of the activity will be of an acceptable level
- Provides for appropriate environmental performance outcomes, environmental performance standards and measurement criteria
- Includes an appropriate implementation strategy and monitoring, recording, and reporting arrangements
- Does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property with the meaning of the EPBC Act
- Demonstrates that:
  - an appropriate level of consultation, as required by Division 3, has been carried out, and
  - the measures (if any) adopted, or proposed to be adopt, because of consultations are appropriate, and
  - Complies with the OPGGS Act and the Environment Regulations.

Under the Commonwealth government streamlining arrangements, NOPSEMA's assessment of this EP provides an appropriate level of consideration of the impacts to matters of national environmental significance (MNES) protected under Part 3 of the EPBC Act.

Further, the consultation process undertaken has been developed in line with legislative requirements under the OPGGS Act and the Environment Regulations, case law and NOPSEMA Guidance.

1.6.2. State Legislation

In the event of a hydrocarbon release from a loss of well control (LOWC) event or a tank rupture from a vessel collision, there is the potential for the spill to impact on State waters and/or shorelines. Relevant state legislation in listed in Appendix A.

1.6.3. Environmental Guidelines, Standards and Codes of Practice

A number of international codes of practice and guidelines are relevant to environmental management of the petroleum activity. Those considered most relevant are listed in Appendix A.

1.7. Definitions

The definitions provided for in the Environment Regulations take precedence throughout the EP. Important terms used in the EP which warrant definition and are not defined by the Environment Regulations are provided in Table 1-3.

Table 1-3: Definitions

Term	Definition
Acceptable level	The specified amount of environmental impact and risk that an activity may have which is tolerable, is consistent with all relevant principles, and does not compromise the management/conservation/protection objectives of the environment.
Activity	Refers to a 'petroleum activity' as defined under the OPGGS(E)R as: petroleum activity means operations or works in an offshore area undertaken for the purpose of exercising a right conferred on a petroleum titleholder under the Act by a petroleum title or discharging an obligation imposed on a petroleum titleholder by the Act or a legislative instrument under the Act. For the Otway Exploration Drilling Program the 'activity' is described in Section 2 and includes seabed surveys and the drilling of up to 6 exploration wells, and the use of a drilling rig, vessels and associated equipment.
As low as reasonably practicable (ALARP)	The ALARP principle refers to reducing impacts and risk to a level that is `as low as reasonably practicable'. In practice, this means that the titleholder has to show through reasoned and supported arguments that there are no other practicable options that could reasonably be adopted to reduce impacts and risks further, i.e. to demonstrate that the cost involved in reducing the impact or risk further would be grossly disproportionate to the benefit gained.
Consequence * Linked to nature and scale	The consequence of an impact or risk is the potential outcome of the activity or event on affected receptors (particular values and sensitivities) and can be positive, neutral or negative.
Control measure	A system, an item of equipment, a person or a procedure, that is used as a basis for managing environmental impacts and risks.
Environment (Values and Sensitivities) *Linked to receptors	Defined under the OPGGS(E)R (Environment Regulations) as: • ecosystems and their constituent parts, including people and communities • natural and physical resources • the qualities and characteristics of locations, places and areas, and • the heritage value of places and includes • the social, economic and cultural features of the matters mentioned above.
Environmental aspect	An element of an activity that interacts or can interact with the environment. Environmental aspects can have a direct impact on the environment, contribute only partially or indirectly to a larger

Term	Definition
	environmental change or create a risk to one or more environmental receptors. Aspects can be planned (inherent part of the activity i.e., light) or unplanned (not part of the activity i.e., spill).
Environmental hazard	A potential source of harm or damage to the environment, human health, or safety.
Environmental impact	A change to the environment, whether adverse or beneficial, that wholly or partly results from an activity.
Environmental Performance	The performance of a titleholder in relation to the Environmental Performance Outcomes (EPO) and Environmental Performance Standards (EPS) in an Environment Plan.
Environmental performance outcome (EPO)	A measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level.
Environmental performance standard (EPS)	A statement of the performance required of a control measure.
Environmental risk	A change which could occur to one or more environmental receptors, that is caused either wholly or partly by one or more environmental aspects associated with an activity. Environmental risks have a degree of likelihood, and are not certain to occur.
Event	An occurrence of a set of circumstances. An event can be one or more occurrences and can have several causes.
Functions, Interests and Activities (FIA)	Functions: Refers to a power of duty to do something. Activities: To be read broadly and is broader than the definition of 'activity' in section 5 of the Environment Regulations and is likely directed to what the relevant person is already doing. Interests: To be construed as conforming with the accepted concept of "interest" in other areas of public administrative law includes "any interest possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation.
Inherent impact and risk	The level of impact or risk with 'legislative and other requirement' controls in place, before the application of additional control measures.
Likelihood	The likelihood is the chance (or probability) of the event occurring, and only applies to risks.
Measurement criteria	A clear and objective way to evaluate environmental performance. They define how environmental performance will be measured and whether EPOs and EPS have been met during the activity
*Nature and scale	The nature and scale of environmental impacts and risks is determined by an assessment of: • Extent: the area that will be affected by an impact or may be affected by a risk • Severity: the level of environmental impact or risk determined by the consequence category, and • Duration: How often (frequency) and how long an impact will, or risk may, interact with the environment.
*Receptors	Features of the environment that may be affected by impacts and risks.
Relevant Person	An authority, organisation or person specified under Division 3 of the Environment Regulations
Residual impact and risk	The impact or risk remaining after additional control measures have been applied (i.e. after treatment of inherent impacts and risks)
Uncertainty	The degree or lack of confidence in a statement, prediction, or position.

2. Description of the Activity

Section 21(1) of the Environment Regulations requires that the Environment Plan (EP) contains a comprehensive description of the activity, including the following:

- The location or locations of the activity
- General details of the construction and layout of any facility
- An outline of the operational details of the activity and proposed timetables, and
- Any additional information relevant to consideration of environmental impacts and risks of the activity.

This chapter provides a comprehensive description of, and context about, the proposed exploration activities and aspects of the activities that interact with the environment, in order to inform the identification and evaluation of environmental impacts and risks. It describes the scope and bounds of the exploration program, including spatial extent and duration, operational schedule and plan, and activity timeframes, so that there is certainty regarding the activity proposed.

The broader design envelope described below forms the basis for environmental assessment, to ensure that all activities and contingencies are included within the scope of this EP. Where an activity or activity component is not described within the design envelope, it will not form part of the EP acceptance and may require a revision to the EP.

Any contradiction to the activity description in other areas of the EP is unintentional and information in this chapter takes precedent.

2.1. Activity Design, Location and Timing

The design of the Otway Exploration Drilling Program has been influenced by exploration objectives, environmental impact and risk assessment findings, and consultation feedback. The program consists of a number of activities related to seabed survey, drilling and support operations which are described in more detail in the following sections.

The program design can best be described using two parameters:

- The Design Envelope: being the broadest timeframe and spatial extent of the program, and
- The Operating Envelope: which will narrow the timing and location of the program.

2.1.1. Design Envelope

The design envelope is defined by operational areas and maximum durations, as shown in Table 2-1.

Operational Areas represent the broadest area within which petroleum activities can occur. Operational areas are located predominantly within the relevant petroleum titles (T/49P and VIC/P79) and have been selected based on similar constraints around rig operations and well design. Where operational areas extend outside of the existing petroleum titles, ConocoPhillips Australia will apply for and secure an Access Authority (AA), as relevant, from the National Offshore Titles Administrator (NOPTA), prior to the commencement of activities in these areas (Org ID: 593, Event ID: 3134, FB ID: 264). Activities in these areas will be ‘other than drilling a well’ and may include the placement of anchors, the collection of geophysical and geotechnical data, and the operation of vessels.

The operational areas for the Otway Exploration Drilling Program are shown in Figure 1-1. Water depths within operational areas range from approximately 53 m to 500 m.

Vessels will traverse from coastal departure locations to the operational areas and may reside outside of the operational areas from time to time. However, vessels moving to or residing outside operational areas are not considered part of the petroleum activity until such time that they enter an operational area.

The initial activity involves completing seabed surveys over a maximum of nine locations, which will commence no earlier than 1 April 2024. Drilling commencement and will occur no earlier than 1 October 2024. The term of the approval for these activities will continue until 31 December 2028, to allow for the drilling of a maximum of six exploration wells and to account for rig availability.

Table 2-1: Design envelope

Parameter	Seabed Survey	Drilling
Earliest Start Date	1 April 2024	1 October 2024
Latest Finish Date	31 December 2028	31 December 2028
Maximum Number of Locations	9 (to support confirmation of final drilling locations)	6 (2 firm wells and up to 4 optional wells)
Spatial Extent (within which activity can occur)	Operational Areas associated with T/49P and VIC/P79	Operational Areas associated with T/49P and VIC/P79

2.1.2. Operating Envelope

The operating envelope presents a narrowing of the timing and location of activities as shown in Table 2-1.

The seabed survey is predicted to take up to one week at each of the nine locations, excluding vessel transit time between locations, and is expected to cover an area of 6 x 6 km around each of the proposed drilling areas. A 500 m radius Safe Navigation Area (SNA) will be established around seabed survey vessels and any towed equipment when conducting seabed survey activities.

A **Drilling Area** will be established around each exploration well within the broader operational areas. Each drilling area will be represented by a 2 km radius cautionary zone around the well site while the rig is moored on location. This radius encompasses the outer extent of mooring equipment and the 500 m Petroleum Safety Zone (PSZ). The 2 km radius drilling areas represent the area within which other marine users may be displaced while the drilling rig is on location.

Each well will typically take 30-40 days to drill, but may take up to a maximum of 90 days to account for potential operational delays and environmental constraints like weather events. Drilling days may occur back-to-back but are more likely to occur over planned unspecified intervals to allow time for equipment deployment, weather delays, contractor downtime, equipment maintenance and movement between wells. After a well is completed, the drilling rig is moved to the next location.

Seabed survey, drilling and support operations will be conducted on a 24-hour, 7-day per week basis.

Table 2-2: Operating envelope

Parameter	Seabed Survey	Drilling
Maximum Duration	1 week per seabed survey location	Up to 90 days of drilling per location
Spatial Extent (within which activity will occur)	324 km^2 (Nine locations, each 6 x 6 km) within Operational Areas	75 km^2 (Six locations, each a 2 km radius Drilling Area) within Operational Areas

2.1.2.1. Process to Select Final Drilling Locations

The process for selecting final drilling locations involves the completion of seismic data processing, interpretation of the data to select targets with a high probability of success, and analysis of the efficiency of the drilling program to confirm resources with the least amount of wells, and the resultant impacts and potential risks associated with each.

The timing for the completion of this process is mid-late 2024. Consequently, ConocoPhillips Australia have undertaken to assess the environmental impacts and risks associated with seabed survey and drilling activities conducted anywhere within the broader operational areas defined in the design envelope. This ensures that the impacts and risks associated with seabed surveys and drilling activities in all potential area are assessed, whereas actual seabed surveys and drilling activities will only be undertaken within the smaller spatial extents defined in the operating envelope.

The operational areas Figure 1-1 represent the area within which all petroleum activities will occur and are located predominantly within relevant permit areas (T/49P and VIC/P79). Areas outside of the permit areas will be covered by AAs, as relevant, prior to the commencement of activities in these areas.

2.2. Operational Details of the Petroleum Activity

This section outlines the operational details of the activities undertaken as part of the overall petroleum activity, which interact with the environment and therefore have the potential to result in environmental impacts or risks to the existing environment. They include seabed survey, drilling and support activities.

2.2.1. Seabed Surveys

Seabed surveys will be undertaken to assess the state of the seabed at up to 9 potential drilling and anchoring locations. Survey techniques may consist of multibeam echosounder (MBES), side scan sonar (SSS), sub-bottom profiling (SBP), magnetometry or gradiometry and imagery, as well as limited geotechnical sampling to validate other survey information and confirm anchoring and benthic conditions.

MBES, SSS and SBP are typically conducted simultaneously. Magnetometry/gradiometry may be conducted at the same time or may be completed sequentially depending on data quality implications, the identification of anomalies requiring further investigation and/or target areas.

The positioning of geophysical surveys may require the use of ultra-short baseline (USBL) techniques including transducers mounted on the ship hull, and transponders mounted on the seafloor, on an ROV or towed above the seafloor. Where a transponder is lowered to the seabed, a sandbag anchor will remain on the seabed after recovery of the transponder (typical footprint of approximately 0.2 m^2) and cannot be recovered without the risk of entanglement.

Data from the geophysical survey may be used to determine geotechnical sampling locations. Geotechnical sampling will include grab sampling, core sampling and penetrometer tests. These techniques are used to determine shallow and surface geology / sediments and verify SSS and imagery interpretations. Seabed sampling equipment is deployed over the side of a vessel and placed on the seabed where the sample is collected. Locations of sampling will be decided following assessment of SSS and imagery. Up to 12 sampling locations are expected with an indicative total footprint of 0.072 m^2 for all samples at each well location.

Seabed surveys will be conducted by one or two vessels travelling at slow speeds during data acquisition, or stationery using dynamic positioning (DP) with no anchoring e.g., during geotechnical sampling. There will be a 500 m radius Safe Navigation Area (SNA) established around the survey vessel and any towed equipment for the duration of the activity.

Survey vessels run on a light marine fuel such as marine diesel oil (MDO), or marine gas oil (MGO) and no refuelling is typically required at sea. Vessels routinely discharge a variety of wastewater streams to the marine environment including sewage and greywater, putrescible waste, cooling water, brine, and oily bilge water (see Table 2-6).

In the event of unsafe environmental conditions (e.g., heavy sea state), equipment may be retrieved, and/or survey vessel(s) may transit away from the operational areas to a safer location, noting that once a vessel leaves the operational area, it is no longer undertaking a petroleum activity.

Environmentally relevant details for the seabed survey to inform impact and risk assessment are provided in Table 2-3.

Table 2-3: Environmentally relevant details for seabed surveys

Parameter	Details	Environmentally Relevant Information
Exclusion Zone(s) around vessel(s) and any towed equipment	500 m Safe Navigation Area (SNA)	Represents the area within which other marine users will be displaced.
Total Crew Accommodation	20 people on board (POB)	Informs the volumes of sewage, greywater, brine and putrescible (e.g. food) wastes generated.
Endurance at Sea	Varies depending on activities being conducted	Informs the maximum duration at sea, with refuelling and crew transfers occurring in-port.
Largest Fuel Tank	350 m^3 light fuel	Informs a worse-case credible oil spill risk in event of vessel collision.
Fuel Type	Marine Diesel Oil, Marine Gas Oil	
Propulsion – Main Engines and Dynamic Positioning	Source levels from main engines operating at all times, and dynamic positioning operating during specific activities e.g. grab sampling	Informs expected continuous (non-impulsive) sound levels during specific activities.
Propulsion and Power – equipment types	Main engines, generators and bow thrusters	Result in discharges of cooling and oily bilge waters and inform the potential for water quality and associated impacts.
Lighting for Navigation and Safe Work	Minimum required for safe operations	Informs the potential for lighting impacts.
Geotechnical survey techniques	Piezocone penetration tests (CPTu) and grab sampling	Informs the area of seabed interaction
Geophysical survey techniques	Sub-bottom profiling (representing the survey technique with the loudest sound source)	Informs a worse-case credible impulsive sound level during geophysical sampling.
Fuel consumption	7 m^3/day	Informs emissions to atmosphere.

2.2.2. Drilling Operations

Exploration wells will be drilled using a single semi-submersible mobile offshore drilling unit (MODU, rig or drilling rig). Each individual exploration well will be drilled, evaluated, tested and then plugged and abandoned prior to moving on to the next exploration well as all wells will be drilled with a single drilling rig (Org ID: 593, Event ID: 3133, FB ID: 257; Org ID: 470, Reyhall Pty Ltd, Event ID: 2417, FB ID: 124).

Drilling involves a number of steps, as detailed in this chapter, including:

- Movement of the drilling rig within the operational area, including entry to and exit from the area.
- Establishment and recovery of mooring equipment including the deployment and recovery of anchors and mooring lines, including potential for pre-laying anchors (which may take 4-6 days to complete depending on weather and the final mooring design) before the drilling rig arrives. [Point updated in response to Matter: I17].
- Drilling conductor and surface hole sections, both of which are then cased in steel pipe and cemented in place.
- Installing a blowout preventer (BOP), an assembly of specialised safety valves put in place well before drilling into the reservoir, that is used in the unlikely event of an emergency to control well pressure and prevent a loss of well control release.
- Installing a marine riser to return drilling fluids and cuttings to the rig for reconditioning, recirculation and/or discharge while drilling continues towards the target reservoir.
- Drilling and constructing the well to the target gas formation, with the installation of cemented casing strings, and then evaluating formations to determine if they contain and can produce hydrocarbons.
- In the event that a hydrocarbon reservoir is discovered, the well may be tested by flowing hydrocarbons to the surface for analysis and then flaring through the flare boom.
- Contingency activities such as sidetrack drilling, re-drilling sections and re-spudding of a well.
- General operations associated with the use of a drilling rig, vessels, helicopters and remotely operated vehicles (ROVs) within the operational area, and

- Permanently plugging the well with cement barriers and removing all equipment from the seafloor.

Additional detail on these steps is provided in the following sections, with collated environmentally relevant details for drilling operations, including well evaluation and testing, provided in Table 2-4 to inform the impact and risk assessments. Additional specifications for the drilling rig are provided in Table 2-5.

Table 2-4: Environmentally relevant details for drilling operations

Parameter	Details	Environmentally Relevant Information
Exclusion Zone(s)	500 m radius Petroleum Safety Zone (PSZ) 2 km radius cautionary zone	Represents the area around each drilling location within which other marine users will be displaced.
Total Crew Accommodation	Rig: up to 140 people on board (POB) Vessels: typically 20-40, but up to 60 POB each	Informs the volumes of sewage, greywater, brine and putrescible (e.g. food) wastes generated.
Endurance at Sea	Varies depending on equipment and materials including bulk transfers of chemicals, wastes and supplies	Informs where activities may take place: - Resupply of the rig will occur within the operational area. - Refuelling of the rig will occur within the operational area.
Largest Externally Exposed Fuel Tank for Vessels	350 m^3 light fuel	Informs a worse-case credible oil spill risk in event of vessel collision.
Fuel Type	Marine Diesel Oil, Marine Gas Oil	
Rig Operations	Source levels from vibrating equipment and drilling	Informs expected non-impulsive sound levels during specific activities.
Support Vessel Propulsion	Source levels from main engines operating at all times, and dynamic positioning operating during specific activities e.g. resupply	
Mooring System	Maximum of 12 anchors and chains up to 1.6 km in length each	Informs the area of seabed interaction
	Source levels from thrusters	Informs a worse-case credible non-impulsive sound level during heavy sea states.
Propulsion and Power – Equipment Types	Main engines, generators and bow thrusters	Result in discharges of cooling water and generation of oily bilge waters and informs the potential for water quality and associated impacts.
Lighting for Navigation and Safe Work	Minimum required for safe operations	Informs the potential for lighting impacts.
Flow Rates to Flare and Duration	Maximum of 40 MMscf/d flow rate, for 120 hours per well over multiple short-term events	Informs emissions to atmosphere and light emissions.
Well Evaluation Techniques	Vertical Seismic Profiling (representing the evaluation technique with the loudest sound source)	Informs a worse-case credible impulsive sound level during well evaluation over a maximum 20-hour testing period per well.

Table 2-5: Typical moored semi-submersible specifications (based on Transocean Equinox)

Component	Specification
Dimensions	116 m long by 97 m wide
Main deck height (at operational draft)	22 m (approximately)
Derrick height (at operational draft)	85 m (approximately)
Transit speed	7 knots
Fuel oil storage	2,600 m^3
Potable water storage	681 m^3
Drill water storage	1,508 m^3
Brine storage	680 m^3
Base oil storage	629 m^3

Component	Specification
Liquid mud storage	1,445 m^3
Bulk material storage	340 m^3
Sack storage	177 m^3

2.2.2.1. Transit and Anchoring

The rig will either mobilise with its own propulsion system and/or be towed into position by Anchor Handling Tug Supply (AHTS) vessels between either a Victorian port or another location within Commonwealth waters.

The rig will be held in position by moorings typically spread (either 8 or 12 anchors depending on the contracted rig), in a radial pattern extending from the drilling rig within the 2 km radius drilling area and may be supplemented by a thruster assisted mooring system.

Anchors will be laid in position by the AHTS vessels. The anchor lay activities may occur up to 3 months prior to transit of the MODU to an operational area. Anchor lay and repositioning activities may also occur during the transit period or when the MODU is within an operational area. Once the MODU is connected to the anchors via the mooring lines the MODU will winch in the slack from the mooring lines to the required tension.

The anchors will not be located more than 2 km from the MODU. Each anchor has an anchor chain which will not be more than 1.6 km long and is designed to lie on the seabed. Each anchor and its chain will not occupy more than 500 m^2 of the seabed. The anchor handling and positioning activities end when all anchors and anchor chains are removed from an operational area.

2.2.2.2. Routine Operations

Up to three support vessels may be present within the operational area at any one time. Each support vessel will typically have 20-40 persons on board (POB), but no more than 60 POB. The MODU will have no more than 140 POB. Routine discharges from seabed survey vessels, the MODU and support vessels are presented in Table 2-6.

MODU refuelling (bunkering) will occur approximately once a month, or as required, during the activity within the operational areas. Vessel refuelling will occur at port. Helicopter refuelling may occur on the MODU during the activity.

Routine discharges from the MODU and each support vessel within each drilling area are estimated below based on data provided for similar activities in the area.

Table 2-6: Routine discharges from seabed vessels, the MODU and support vessels within the operational areas (Vessel ~40 POB and MODU 140 POB)

Discharge Type	MODU Typical quantities	Vessel Typical Quantities (each)
Putrescible Waste	280 kg/day (2 kg pp/day)	80 kg/day (2 kg pp/day)
Treated Sewage and Grey Water	60.2 m^3/day (0.43 m^3 pp/day)	17.5 m^3/day (0.43 m^3 pp/day)
Treated Oily Water	80 L/day (combined)	
Treated Bilge Water	Limited to holding capacity of bilge on vessel and MODU (combined)	
RO Brine	170 m^3/day (combined)	
Cooling Water	4,800 m^3/day (combined)	
Atmospheric Emissions (e-CO2)	195 ktCO_2e (combined for seabed survey and drilling activities)	

2.2.3. Drilling Activities

Drilling activities relevant to environmental management include the application of drilling fluids, the management of drill cuttings, cementing operations, well testing, plug and abandonment and contingency activities.

2.2.3.1. Drilling Fluids, Cuttings and Blow-Out Preventer (BOP)

Drilling fluids (also known as drilling muds) are used in drilling operations to carry rock cuttings to the surface and to lubricate and cool the drill bit. Discharges of drilling fluids and cuttings, and discharges from BOP testing and latching have been quantified in Table 2-7.

Riserless Section

A combination of seawater and high-viscosity gel sweeps will be used as drilling fluid for the initial conductor and surface-hole sections, with discharge to the seabed. Gel sweeps are typically comprised of pre-hydrated bentonite, viscosifier (e.g. Xanthum gum) and often a small concentration of soda ash. Up to approximately 420 m^3 of cuttings and 1750 m^3 drilling fluids are discharged during drilling top-hole sections, for each well (see Table 2-7).

Installation of Riser and BOP

After drilling of the riserless section is complete, a riser and Blow-out Preventer (BOP) are installed.

Water-based Drilling Fluid

Subsequent intermediate and target-hole sections will be drilled with water-based drilling fluids (WBDF) with each well using approximately 2980 to 4580 bbl of drilling fluid. The riser will return drilling fluids and cuttings to the MODU, where the drilling fluids will be separated using solids control equipment (SCE). The SCE may include, but is not limited to, shale shakers and centrifuges. Shale shakers are used to remove coarse cuttings from the drilling mud. The recovered mud from the cuttings may then be directed to centrifuges to remove fine solids. The cuttings are typically discharged below the water line and the mud is recirculated into the fluid system. Approximately 300 m^3 of cuttings and 2000 m^3 of drilling fluids on cuttings may be discharged to sea during and following drilling of bottom-hole sections for each well, including potential side-track. Drilling fluids may be discharged intermittently in batches ranging from around 1 m^3 to 400 m^3 and depending on volume, may be discharged over a matter of minutes or several hours.

Non-aqueous Drilling Fluid (Contingency Activity)

The decision to use non-aqueous drilling fluids (NADF) for the bottom hole sections of a particular well is based on various technical factors relevant to wellbore conditions such as well temperature, shape and depth, reactivity of the formation to water and well friction. The use of NADF is subject to formal technical justification, with consideration of environment, health, safety and waste management implications, and approved in accordance with the Best Practice – Overburden Drilling Fluids Environmental Requirements. The main ingredient of NADF is base oil and a range of standard solid and liquid additives may be added to alter specific mud properties depending on the conditions encountered while drilling. NADF that cannot be re-used (i.e. does not meet required drilling fluid properties or are mixed in excess of required volumes) are recovered from the mud pits and returned to the shore base for onshore processing, recycling and/or disposal. When NADF is no longer required, the mud pits and associated equipment/infrastructure are cleaned with wash water treated onboard through solids control equipment prior to discharge with mud pit washings or returned to shore for disposal if discharge criteria cannot be achieved.

If NADF is needed to drill a well section, the cuttings which are separated from the NADF via the shakers will also pass through a cuttings dryer to reduce the residual fluid on cuttings (ROC)% to ≤8% ROC (dry weight) per well section prior to overboard discharge.

BOP

The BOP is an assembly of specialised safety valves put in place in the early stages of drilling (before drilling into any target zones) to be used in the case of an emergency to control well pressure and prevent a blowout. It is installed between the wellhead system and the seabed. Once installed, all further drilling is conducted through the BOP. The BOP is tested every 7-days. During testing approximately 2200 L of potable water with

3 % water-soluble control fluid is released, and smaller volumes are released when latching and unlatching the BOP at the start and end of each well.

2.2.3.2. Cementing Operations

Cement is used to seal the casing following drilling of each section. Primary cement jobs are planned for cementing the conductor, surface casing and intermediate strings in place with each well using approximately 1150 to 1600 bbl of cement. These cement jobs will provide a structural base for the well and are critical to well integrity. Any cement remaining after the cement operations would be discharged to the seabed.

Prior to the commencement of cementing operations, the cementing unit is tested resulting in a discharge of between 2.4 m^3 to 8 m^3 of cement slurry to sea per well. Cement is used at other key junctures of the well installation process to provide well integrity. In some cases, excess cement will be circulated back to surface and discharged into the sea. This will not exceed 40 m^3 per well plus 25 m^3 excess at the final well location.

Routine cement discharges from the drilling operations are quantified below (Table 2-7), based on data provided for similar activities in the area.

Table 2-7: Routine drilling discharges within drilling area

Discharge type	Typical quantities
Drilling Cuttings – Seabed Discharge	420 m^3 per well
Drilling Cuttings – Surface Discharge	300 m^3 per well
Water-based Mud – Seabed Discharge	1750 m^3 per well
Water-based Mud – Surface Discharge	2000 m^3 per well
Cement Discharges to sea – from testing, spoils and excess volumes	< 40 m^3 per well and up to 25 m^3 excess at final well location
Cement Discharges to seabed – Riserless Sections	30 m^3 per well
BOP Hydraulic Fluids	2,200 L of potable water with 3 % water soluble control fluid every 7 days, and smaller volumes when latching and unlatching BOP at the start/end of each well.

2.2.4. Well Formation Evaluation

Downhole formation evaluation will be performed on all wells. This may include both Logging Whilst Drilling (LWD) and/or Wireline Logging. The following logs may be acquired: Gamma Ray log, Resistivity logs, Neutron Porosity, Density logs, Sonic logs, Formation Pressure measurements, Vertical Seismic Profile (VSP or CheckShot), Borehole Image log and coring (full hole core or sidewall core).

Well formation evaluation may be conducted over up to seven days, with VSP (or similar) undertaken for a maximum duration of 20 hours per well, for a maximum of 6 wells, during this process (Org ID: 5, Colac Otway Shire Council, Event ID: 2665, FB ID: 138). Small volumes of gas may be vented during wireline logging, testing and sampling.

2.2.5. Well Testing

The type of hydrocarbon is expected to be gas with a potential for associated condensate. If hydrocarbons are found and confirmed during formation evaluation, a well test may be undertaken. The purpose of a well test is to confirm the existence of transportable hydrocarbons, evaluate target characteristics and flow rates, assess non-hydrocarbon components, measure liquid yields, and obtain representative fluid samples.

During the well test, reservoir fluids are flowed to a temporary process and handling facility on the MODU, with all reservoir and production parameters being recorded during this process. The fluid streams will be separated into oil, gas and water phases using a temporary production separator. Any flammable hydrocarbons will be diverted to the flare booms for flaring via high efficiency burners. There is no planned cold venting of hydrocarbons during the well test, although there may be incidental unburnt hydrocarbon gas emitted if flowing to the surge tank, and when lines are purged at the completion of the test. Non-flammable fluids, including any produced formation water or completion brine initially present in the wellbore, will be passed through a water filtration system to reduce the oil in water content to below 30ppm prior to overboard discharge. Fluid not meeting the 30ppm criteria which cannot be cleanly flared will be stored in tanks for later onshore disposal.

During the well test, a steam heat exchanger will likely be utilised to heat the process fluids to both prevent hydrate formation and avoid exceeding minimum temperature ratings. The water that condenses from the steam during this process will be discharged to sea.

To mitigate the risk of hydrate formation, methanol may be injected into the process stream during the well test at rates of approximately 1 to 5 L/min. The methanol will either be flared or passed through the oil-in-water treatment package if dissolved in the water phase. Note that methanol injection would cease as soon as process temperature is sufficiently high to avoid hydrate formation. A mixture of monoethylene glycol (MEG) and water may also be used for hydrate prevention if there are well intervention operations – if this mixture is recovered it will be passed through the oil-in-water treatment package.

The total flaring conducted per well test is anticipated to be less than 120 hrs in total, which may comprise several short-term flaring events. Flow rates are predicted to be in the range of 8 MMscf to 20 MMscf per day, with a maximum up 40 MMscf per day. ConocoPhillips will minimize the total flaring time by continuously monitoring the reservoir and production parameters during the well test to ensure that flaring will cease as soon as the required data has been collected.

Upon completing the well test, the well will be 'killed' by pumping specialized well control fluids, known as kill mud or kill weight fluid, into the well at a carefully calculated rate and density. This is done to exert enough hydrostatic pressure to overcome the formation pressure and halt the flow from the formation. The well will then be plugged and abandoned as per the approved abandonment program.

2.2.6. Plugging and Abandonment

ConocoPhillips Australia will plug and abandon (P&A) each exploration well, prior to moving the MODU off location, to complete the drilling activity. P&A involves permanently sealing the wellbore. This involves sealing the reservoir section and isolating different permeable formations to prevent crossflow. This then mitigates the risk of a potential release of well bore fluids to the marine environment.

Plugging the well involves the placement of cement plugs to provide a 'rock to rock' seal above each of the permeable formations (hydrocarbon or water reservoirs). The rock to rock barrier could be through cement plugs or a combination of cement plugs set adjacent to cemented casing where there is an impermeable formation (cap rock). The specific number and placement of plugs depend on factors such as well depth, casing design, formations encountered and regulatory requirements.

The cement used for each plug is carefully prepared and pumped into the wellbore under controlled conditions. The cement is allowed to cure, creating a permanent barrier. Verification tests, such as tagging, pressure tests and cement bond logs, are conducted to ensure the integrity and effectiveness of the cement barriers meets the requirements outlined in the Well Operations Management Plan (WOMP).

Following P&A operations and confirmation of the permanent barriers, the wellhead is cut with the use of a mechanical cutting tool and removed below the mudline (approximately 1.5 m below the seabed) leaving no remaining well infrastructure on the seabed. The cutting process produces metal shavings (swarf), some of which remain on the seabed. A survey of the seabed will be conducted by a Remotely Operated Vehicle (ROV) to confirm the seabed is clear of any debris.

Detailed records and documentation of the P&A process are prepared and submitted to regulatory authorities. These records serve as a permanent record of the well's status and the actions taken during the P&A process.

2.2.7. Support Activities

There are three main support activities involving the use of vessels, aircraft and remotely operated vehicles (ROVs). In the unlikely event of an emergency additional vessels and aircraft may be deployed to assist the response efforts.

2.2.7.1. Vessels

The MODU and drilling activities will be supported by up to three vessels which will travel between the drilling area and a local port for the duration of the activity. Support vessels are considered part of the activity when they are in an operational area. The vessels will either be stationary or operating at slow speeds while undertaking activities within an operational area including:

- Towing the MODU to/from each well location
- Supporting mooring and drilling activities
- Monitoring the PSZ around the MODU
- Providing MODU standby support including close standby
- Transferring of provisions (food, bulk materials, fuel), equipment and wastes to and from the MODU and shore base (resupply operations), and
- Facilitating site and equipment inspections/surveys before and after MODU arrival.

The maximum size of externally positioned fuel tanks on vessels undertaking activities within an operational area will be 350 m^3. Details on routine vessel discharges within an operational area are included in Table 2-6 above.

Bulk dry cement and bentonite is transported to the MODU via supply vessels and transferred to dry bulk storage tanks. During the transfer process, the holding tanks are vented to atmosphere, resulting in small amounts of dry cement or bentonite being discharged from venting pipes located under the MODU. Routine operational discharges within an operational area are detailed in Table 2-6.

Based on a review of operational details from Beach Energy’s Otway drilling campaign, conducted from February 2021 to July 2022, resupply operations are predicted to occur near-daily for an average duration of 3 hours.

The transit of vessels outside the operational areas is outside the scope of EPs and are managed under the Commonwealth Navigation Act 2012.

2.2.7.2. Remotely Operated Vehicles (ROVs)

An ROV is a tethered underwater vehicle deployed from a vessel or from the MODU. ROVs are unoccupied, highly manoeuvrable and operated by a crew aboard a vessel or MODU. They are linked by either a neutrally buoyant tether or often when working in rough conditions or in deeper water a load carrying umbilical cable is used along with a tether management system. Most ROVs are equipped with at least a video camera and lights. Additional equipment may include sonars, magnetometers, a still camera, a manipulator or cutting arm, water samplers, and instruments that measure water clarity, water temperature, water density, sound velocity, light penetration, and temperature.

ROVs will be deployed and controlled from either the MODU or support vessel to undertake:

- Pre-activity site surveys
- Equipment deployment, monitoring and retrieval
- Tool deployment and operation
- BOP and riser inspection

- BOP activation under emergency conditions

2.2.7.3. Aircraft

Aircraft, including helicopters, fixed wing planes and drones, may be used to provide support for crew changes, critical supply deliveries, surveillance and emergency response use. Helicopter operations may occur several times per week and are considered part of the petroleum activity once within the drilling area. Refuelling of helicopters may occur onboard the MODU during the activity.

2.2.8. Contingency Activities

2.2.8.1. Side Tracking

A side track contingency has been included to cover the unlikely event that the well result is poor, geological formations are encountered that are difficult to drill through, or damage to a well occurs that requires bypassing.

If a sidetrack is required, the initial hole would be abandoned in accordance with regulations using cement plug(s) and a higher density cement plug or downhole kick-off tool (whipstock) would be used to generate a separation (kick off) from the original well for side tracking. A window would be milled into the original casing (and any cement) to create an opening for the new well and the drilling assembly would be guided through the window to continue drilling the side track wellbore. Activities subsequent to side tracking will be the same as was planned for the original wellbore.

2.2.8.2. Respudding

Respudding may be required if problems are encountered that result in it being impractical to continue to drill in the current well. This may be due to down hole failure, or the well being constructed in a manner which is outside of tolerance, e.g. excessive conductor inclination. Additionally a decision may be made to undertake a geological sidetrack to test an alternative bottom hole location. In this situation, the current well would be abandoned in accordance with regulations and the MODU would be moved to an alternative location within the area covered by seabed survey and well construction operations repeated. Problems requiring a respud typically occur during riserless operations, where remediation options are more limited. Respudding will result in an increased volume of cuttings and cement discharges.

2.2.8.3. Temporary Well Suspension

During drilling activities, the well may need to be temporarily suspended. Suspension involves establishing suitable barriers, removing the riser and disconnecting the MODU from the well. The BOP may sometimes be left in place to act as a barrier. Suspension may be short term (e.g. in the case of an extreme weather event) or longer term (more than one year). On return to a well after suspension, the MODU reconnects to the well with the BOP in place, barriers are removed and the drilling activity resumes.

2.2.9. Changes to the Activity Description

The activity envelopes presented in the initial project information sheets (February 2023), the Preliminary Environmental Impact and Risk Assessment (April 2023) and subsequent Project Updates and Information Sheets, have been refined over time during assessment and consultation. The nature of specific changes and the reasons for them continue to be communicated through regular updates and the Otway Consultation Hub (public website).

3. Consultation

Pursuant to Division 3 of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (the Environment Regulations), and considering recent case law (Tipakalippa), ConocoPhillips Australia has undertaken a consultation and engagement process to learn about functions, interests, or activities that may be affected by the proposed Otway Exploration Drilling Program. This allowed for a co-design of the consultation process and the environmental management of the activity. This chapter demonstrates how ConocoPhillips Australia has undertaken a consultation process which allowed for the capture of every possible relevant person[1], managed risks to as low as practicable and acceptable levels, and appropriately responded and adopted measures based on relevant persons objections, claims and feedback.

By capturing a broad area of people through various methods such as community visits, direct correspondence, and targeted media and advertising, ConocoPhillips Australia were able to identify relevant persons, provide them with sufficient information on the possible consequences of the activity on their functions, interest, or activities, allow a reasonable period for the consultation, respond appropriately, and document the details of such process.

The following appendices should be read in conjunction with the consultation chapter.

Appendices

Section 24(b) requires that an environment plan contains a report on all consultations, under section 25, of any relevant person by the titleholder. This report must include the following:

- A summary of each response, and
- An assessment of the merits of objections and claims regarding adverse impacts of activities proposed, and
- A statement of ConocoPhillips Australia's response as titleholder to objections or claims.

Appendix C1: Consultation Report

- The relevant person/organisation ID (that did not request information be maintained as confidential)
  - Their functions, interests, or activities
- Communications
- Summary of each response

Appendix C2: Objections or claims under section 24

- Relevant person ID (Stakeholder ID) (that did not request information be maintained as confidential)
- Objection/claim
- Assessment of merit
- Summary of feedback and response, and measures adopted

Appendix C3: Supplementary Evidence

- In further support of the regulatory requirements, ConocoPhillips Australia has undertaken additional efforts and methods to reach relevant person in the community and raise awareness of the ability to self-identify through various mediums.

[1] *"The requirement that the titleholder "must consult with each" relevant person is a requirement to consult with each and every relevant person. The text of section 25, including the multiple references made to "each relevant person" make that requirement clear." Tipakalippa v National Offshore Petroleum Safety and Environmental Management Authority (No 2) [2022] FCA 1121 at [81]. Although ConocoPhillips Australia recognises some RP's may remain unidentified for reasons later discussed, the methodology employed was reasonably capable of discharging this obligation.*

- Evidence that is associated with multiple people such as project updates.

Appendix C4: First Nations Consultation

- Communal interest facilitated a tailored, fit-for-purpose method of consultation. Which was adopted to reasonably reflect the characteristics of the interests affected by the proposed activity.

Appendix C5: Commercial Fishers Consultation

- Communal interest facilitated a tailored, fit-for-purpose method of consultation. Which was adopted to reasonably reflect the characteristics of the interests affected by the proposed activity.

Appendix C6: Public Comment Report

- Overview of the process applied to assessing and responding to public comments.

Appendix D: Sensitive Information Part (24(b)(iv))

- To comply with section 26(8) of the OPGGS(E)R, the full text of all responses by relevant individuals engaged under section 25 and any other sensitive information (if applicable) must be included in a sensitive information report.
- This report satisfies the remainder of section 24 and section 26(8) by containing full text responses by relevant persons and any additional sensitive information. This report will not be published.

3.1. Legislation and Guidelines

ConocoPhillips Australia's consultation process strictly adhered to all relevant legislation, including:

- Offshore Petroleum and Greenhouse Gas Storage Act 2006
- Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023
- Environment Protection and Biodiversity Conservation Act 1999

ConocoPhillips Australia applied the following guidelines:

- N-04750-GL2086 - Consultation in the Course of Preparing an Environment Plan (Updated May 2023)
- N-04750-PL1347 – Environment Assessment Policy
- N-04750-GL1721 - Environment Plan Decision Making
- N-04750-GN1847 A66207 - Responding to Public Comment on Environment Plans
- N-04750-GL1887 A705589 - Consultation with Commonwealth agencies with responsibilities in the Commonwealth marine area
- N-04750-GN1785 A620236 - Petroleum activities and Australian marine parks
- N-04750-GN1344 - Environment Plan content requirements guidance note
- NOPSEMA publication - Consultation on offshore petroleum environment plans – Information for the Community (May 2023)
- Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (2023)
- Ministerial Council on Mineral and Petroleum Resources (2005) - Principles for Engagement with Communities and Stakeholders.

ConocoPhillips Australia's consultation process was also shaped by the instructive reasons given by the Full Federal Court of Australia, in its appeal decision Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 (Appeal Decision) on 2 December 2022, as outlined in the NOPSEMA guideline Document No. N-04750-GL2086 A900179 (Guideline Document), referenced above.

3.2. Consultation Framework

As captured in the information sheet 'Consultation, Information Sheet 1 – February 2023', ConocoPhillips Australia proposed a process that allowed relevant persons to co-design both the development of the consultation process and the preparation of the EP. The consultation process was designed in the context of the objects of the Environment Regulations set out in section 4, to ensure the OEDP is carried out in a manner:

- Consistent with the principles of ecologically sustainable development (ESD) set out in section 3A of the Environment Protection and Biodiversity Conservation Act 1999; and
- By which the environmental impacts and risks of the activity will be reduced as low as reasonably practicable; and
- By which environmental impacts and risks of the activity will be of an acceptable level.

These objects are "best achieved by a consulting process that is practicable, but is sufficiently broad so as to collect available input into the possible risks and environmental impacts of the activity and ways of reducing those risks and impacts and managing them to an acceptable level."[2] ConocoPhillips Australia used a variety of consultation methods to identify and provide sufficient information for relevant persons to make an informed assessment of the possible consequences of the activity on them. This included working within the local communities, enabling meaningful relationships to be formed, and establishing an environment of two-way communication, transparency, courtesy, and trust. This allowed ConocoPhillips Australia to identify and understand local values and sensitivities of the environment, informing evaluation of potential impacts and risks, and how the consultation process can be co-designed to manage these appropriately. This approach was underpinned by, and upholds, the IAP2 Core Values of Public Participation outlined below:

- Public participation is based on the belief that those who are affected by a decision have a right to be involved in the decision-making process.
- Public participation includes the promise that the public's contribution will influence the decision.
- Public participation promotes sustainable decisions by recognising and communicating the needs and interests of all participants, including decision makers.
- Public participation seeks out and facilitates the involvement of those potentially affected by or interested in a decision.
- Public participation seeks input from participants in designing how they participate.
- Public participation provides participants with the information they need to participate in a meaningful way.
- Public participation communicates to participants how their input affected the decision.

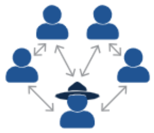
The level of participation by relevant persons in the preparation of the EP was tailored to the functions, interests, and activities of each relevant person on a case-by-case basis and aligns with the IAP2 Spectrum of Public Participation.

ConocoPhillips Australia used the IAP2 Spectrum of Engagement to underpin a consultation framework based on five levels of participation. The associated goals and consultation activities support an ongoing process and two-way conversation aimed at building and maintaining trust and relationships (see Table 3-5 Consultation goals, channels, and applied levels of participation below). Acceptance is ultimately decided by NOPSEMA, not the public, so final step of the IAP2 spectrum 'empower' is not relevant.

[2] *Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 [141].*

Table 3-1: Consultation goals, channels and applied level of participation

Relevant IAP2 Spectrum element	Consultation goals	Consultation channels	Applied levels of participation
Inform 	To provide balanced and objective information to assist persons in understanding the problems, alternatives and/or solutions, to make informed assessments. As the Titleholder, to seek and further understand the environmental values and sensitivities in the EMBA.	Project specific Social Pinpoint website. Activity information sheets. Project hotline and email. Project Updates. Print and radio media notices. Interviews with local TV, radio and print media. Letter box drops and library display on King Island. Digital project notifications.	The methods adopted to facilitate information sharing ensured project information was publicly available and accessible across multiple channels that considered the widest possible range of persons and provided specific information about the OEDP activity and its environmental potential impacts and risks.
Consult 	To obtain specific feedback on analysis, alternatives and/or decisions from relevant persons and the public.	Exchange of letters/emails. Informal discussions. Phone calls. Face-to-face meetings. Iterative public comment process. Q&A sessions in webinars, which were then uploaded to the website, and at Townhalls and Community Information Sessions. Mandated public comment period.	Consultation processes were adapted so that they were fit-for-purpose and tailored to the relevant person and/or provided updates to specific information as the activity definition was developed. As soon as information was available, it was published, on the project website and via email updates, for review and feedback. Attendees at public forums were encouraged to provide comment and feedback (see Q&As at Appendix C3). The Preliminary Impact and Risk Assessment Report was released for review and comment in April 2023. Feedback on objections and claims was shared in a second round of Community Information Sessions (May-July) and webinar 2 on 26th July 2023, where measures adopted following consultation were presented for additional comment and feedback (see Relevant Person Information Session slides at Appendix C3). The draft EP was also released for public review and comment, this opportunity allowed relevant persons to seek more information or raise objections and claims that were assessed and addressed prior to submission to NOPSEMA. The draft EP was released in chapters to allow for greater accessibility. The full EP will be made available for public exhibition prior to submission to NOPSEMA for assessment, which provides the opportunity for the public to provide public comment directly to NOPSEMA.
Involve 	To work directly with relevant persons throughout the process to ensure that their functions, interests, and activities are consistently understood, considered, and addressed.	Phone calls. Emails. Online meetings. Face-to-face meetings.	The methods adopted in this category were targeted and supported the provision of detailed and tailored information to allow informed assessment of the possible consequences of the OEDP activity on the relevant person's specific functions, interests or activities and building of one-on-one relationships (see section 3.7).

Relevant IAP2 Spectrum element	Consultation goals	Consultation channels	Applied levels of participation
Collaborate 	To partner with the public in each aspect of our decision making including the development of alternatives and the identification of the preferred solutions.	Dual consultation process for the public and relevant persons. Participatory decision making.	The concurrent dual consultation processes allowed anyone to engage at their level of choice. Both processes directly influenced the design of the activity, the environmental management measures, and the decision about whether the activity is environmentally acceptable (see Figure 3-3 Consultation framework; also, public consultation Q&As at Appendix C1 and Sensitive Information Report at Appendix D).

ConocoPhillips Australia created a methodology that is practical and fit-for-purpose, applied using a pragmatic, real-world approach and where appropriate, reassessed, and adjusted on information received.

Figure 3-2 (Consultation Timeline) was publicly available on the project specific Otway Exploration Drilling Program website, which helped to highlight the milestones of consultation as they were achieved.

Figure 3-1: Consultation timeline (continued overpage)

Otway Exploration Drilling Program

ConocoPhillips Australia

Otway Exploration Drilling Program Consultation Milestones

Feb 2023
COMPLETE

Notice of Preparation of an Environment Plan

ConocoPhillips Australia sent formal letters and provided information to invite feedback on the proposed activity and timeline, and advised on consultation processes.

- Project Overview Fact Sheet ABU2-000-EX-R01-00010
  Consultation Overview Fact Sheet ABU2-000-EX-R01-00009

Mar 2023
COMPLETE

Information Sessions - Establishing Context

ConocoPhillips Australia began hosting information sessions and webinars to identify and consult with residents and relevant persons whose functions, interests or activities may be affected by the proposed Otway Exploration Drilling Program.

15 Mar 23	King Island	19 Apr 23	Port Campbell
16 Mar 23	Burnie	2 May 23	Port Fairy
17 Apr 23	Warrnambool	17 May 23	King Island
18 Apr 23	Portland	23 May 23	Webinar
19 Apr 23	Peterborough		

May 2023
COMPLETE

Environmental Assessment

ConocoPhillips Australia provided an update on timelines, exclusion zones and area mapping and launched an interactive map for relevant persons. ConocoPhillips Australia also provided fact sheets evaluating environmental impact and proposed mitigations for the actvity.

- Project Update Fact Sheet ABU2-000-EX-R01-D-00011
- Historical Military Ordnance Risks Fact Sheet ABU2-000-EX-R01-D-00017
- Marine Mammals Fact Sheet ABU2-000-EX-R01-D-00016
- Seabirds, Penguins and Marine Turtles Fact Sheet ABU2-000-EX-R01-D-00014
- Commercial Fishing Fact Sheet ABU2-000-EX-R01-D-00012
- Emissions and Discharges Fact Sheet ABU2-000-EX-R01-D-00013

May 2023
COMPLETE

Preliminary Impact and Risk Assessment

ConocoPhillips Australia made the Preliminary Impact and Risk Asssment available for relevant persons to provide a preliminary overview of the types of environmental impacts and risks associated with the activity and the proposed control measures.

May 2023
COMPLETE

Information Sessions - Environmental Impact and Risk Assessment

ConocoPhillips Australia began hosting information sessions and webinars for residents and relevant persons to provide concerns and feedback on the Preliminary Impact and Risk Assessment.

29 May 23	King Island	20 Jun 23	Apollo Bay
30 May 23	Port Fairy	13 Jul 23	King Island
31 May 23	Portland	26 Jul 23	Webinar
19 Jun 23	Peterborough		

Otway Exploration Drilling Program

ConocoPhillips Australia

Jun 2023 COMPLETE

Project Update

ConocoPhillips Australia provided a project update fact sheet with updated milestones, timelines, activity area and an overview of potential environmental impacts.

- Project Overview Fact Sheet ABU2-000-EX-R01-D-00018

Jul 2023 COMPLETE

Consultation Period Extension

Based on relevant person feedback, ConocoPhillips Australia extended consultation on the proposed activity until 31 Aug 23 from the initial date of 31 Jul 23. This ensures all relevant persons have a reasonable period of time to consider the information we have provided and provide feedback.

Aug 2023 COMPLETE

Consultation Period Extension

Based on relevant person feedback, ConocoPhillips Australia extended consultation on the proposed activity until 30 Sept 23. This ensures all relevant persons have a reasonable period of time to consider the information we have provided and provide feedback.

Aug 2023 COMPLETE

Project Update

ConocoPhillips Australia provided a project update fact sheet with proposed activity updates and advised of the consultation extension and draft Environmental Plan chapters being released for review shortly.

Sept 2023 COMPLETE

Draft Environmental Plan Chapters Available

ConocoPhillips Australia released all of the draft Environment Plan chapters for review and asked all relevant persons to raise concerns, including objections and claims, about the potential impacts of the activity by 30 Sept 23. By providing the draft EP chapters, ConocoPhillips Australia aims to ensure all relevant persons are provided with sufficient information so they can make an informed assessment of the potential imacts of the activity

Oct 2023 COMPLETE

Consultation in Preparing an Environment Plan

ConocoPhillips Australia has consulted with relevant authorities, persons and organisations who are potentially affected by activities of the OEDP. Their input has been considered and where appropriate has informed the development of this Environment Plan.

Nov 2023 COMPLETE

Submission to NOPSEMA

ConocoPhillips Australia has submitted the Environment Plan to NOPSEMA, who will decide if the Environment Plan is complete for publication.

Post acceptance OPEN

Ongoing Consultation

Through our Implementation Strategy and consultation and communication plan, ConocoPhillips Australia will continue to engage with relevant persons, organisations and authorities, notifying them of any changes or new information that potentially affects their functions, interests or activities.

3.3. Relevant Person Identification

According to section 25 of the OPGGS(E)R, titleholders are obligated to identify and consult with each authority, person, or organization that meets the definition of a relevant person. This section provides a clear demonstration of who qualifies as a relevant person, and the rationale used to determine that status (Tipakalippa). ConocoPhillips Australia considered several key factors in this process, including the nature of the activity, the environment in which it is being undertaken, and the potential impacts and risks associated with it.

3.3.1. Sufficiently Broad Capture of People and Information

Designing an inclusive, effective and legally compliant consultation strategy requires broad engagement to identify relevant persons. This promotes fairness, transparency, and accountability in decision-making processes, leading to more successful outcomes and reduced risks for all parties involved. ConocoPhillips Australia's process for engagement to raise awareness was broad and comprehensive.

Despite the strict nature of the obligation to consult with "all" relevant persons, the Court recognises there is a necessary need for these persons to be ascertainable and the duty capable of being discharged in a reasonable time.[3] Despite best efforts to raise awareness, ConocoPhillips Australia acknowledges that some persons may remain unidentified, or choose not to engage in consultation, or choose to participate only through the public comment period, and these persons have been and will continue to be encouraged to self-identify and engage in ongoing consultation throughout the life of the activity. Based on the people and information captured, ConocoPhillips Australia has sufficiently identified and evaluated potential environmental impacts and risks. Should new information or persons be identified and be relevant to the OEDP, appropriate change management procedures are in place, outlined in ConocoPhillips Australia's ongoing consultation strategy (10.2.5 as part of the implementation strategy).

Section 25 underpinned the process of relevant persons' early and ongoing participation in the preparation of the EP, which is elaborated on in Figure 3-2 below, Consultation framework for the Otway Exploration Drilling Program.

The process of two-way dialogue depicted in Figure 3-3 ensured that each relevant person(s) was assessed on a case-by-case basis, which enabled tailored consultation based on their functions, interests, or activities and supported the provision of sufficient information and adequate time for review.

[3] *Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 [136].*

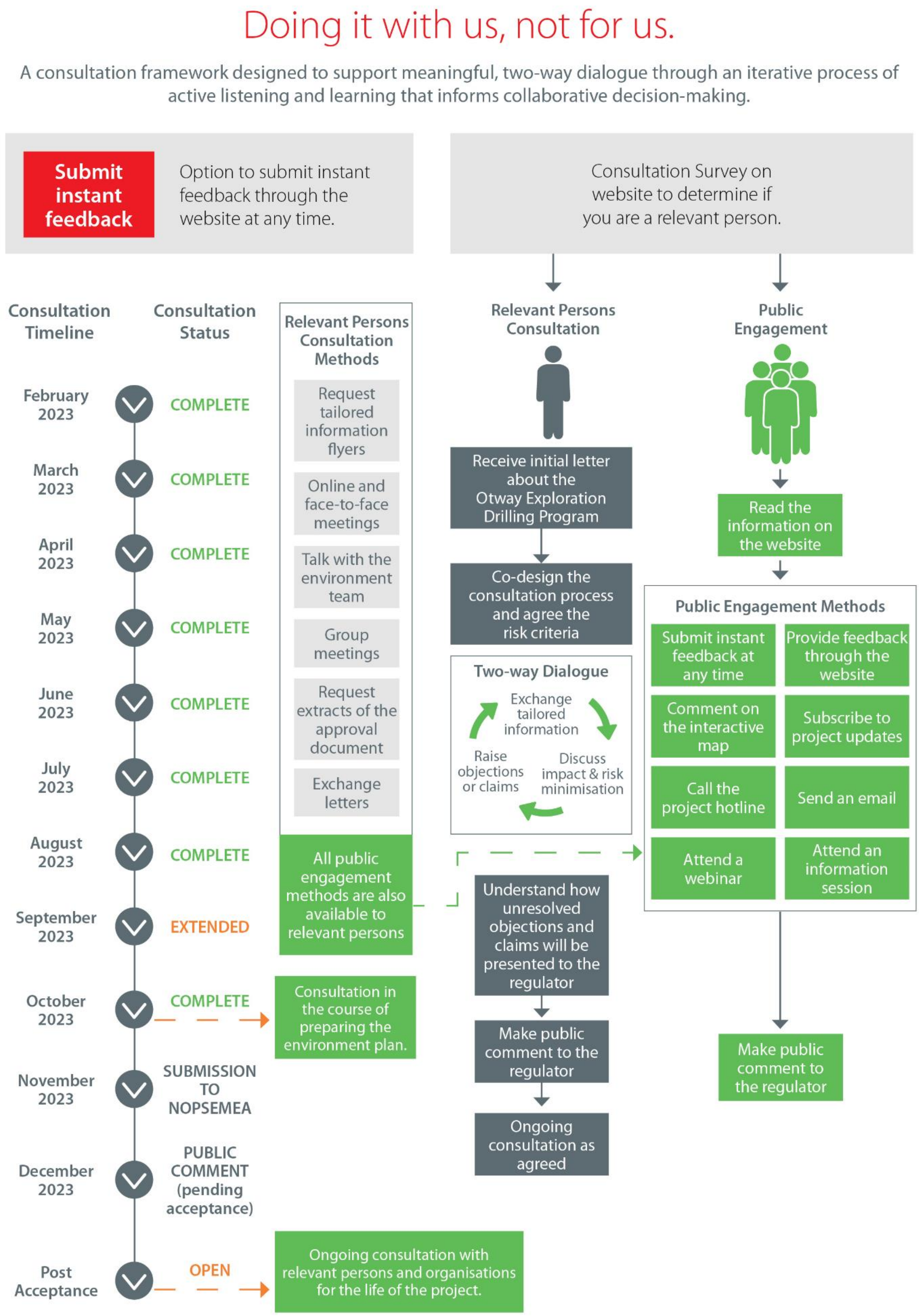


Figure 3-2: Consultation framework for the Otway Exploration Drilling Program

3.3.2. Raising Awareness

The following tools were used to help raise awareness about the proposed project and capture as many relevant persons as possible:

- ConocoPhillips Australia hosted 20 Community Information Sessions, three of which were commercial fisher specific, between March and July 2023 across Tasmania and coastal Victoria at locations close to the proposed operational areas for VIC/P79 and T/49P.
  - Each session was advertised on the project website, in local print media, social media and regional radio (see advertising schedules and social media reports in Appendix C3).
  - Letterbox drop on King Island to raise awareness of the sessions following feedback stating that they couldn't use the QR code to access information on the project website (see recording of the King Island information session publicly available on the project website at King Island Community Information Session May 2023).
- Multiple online webinars
- A QR code was used on all advertising and public information materials to redirect users to a specific landing page on the project website where more detailed information was available.
- 26 separate Campaign emails sent to all identified people (including not relevant persons subscribed for information) at the time, currently totalling 642 separate recipients across a period of 11 months.
  - Full copies of these emails detailed in Appendix C3.
- Multiple door knocks in attempt to reach First Nations communities.
- Multiple telephone calls to relevant persons and organisations to introduce the project, seek direct contacts, and explain the consultation process. Full copies of discussion notes detailed in Appendix C1.
- SMS messages to multiple relevant persons whose mobile contact details were publicly available on websites or social media.
- 91 paid advertisements were placed in national, regional, and Indigenous print media between February and September 2023 to support consultation with relevant persons. The advertisements can be found in Appendix C3.
- 701 radio advertisements were placed on regional radio stations.
- Project Hotline - A project hotline was put in place for the proposed activity in February 2023 with incoming calls cascading to identified project team members during business hours (9am-5pm, Monday-Friday). If none of the team were available, callers were able to leave a voice message which was returned as soon as reasonably practicable. Outside of business hours, callers were able to leave a voicemail which was actioned the next working day.
- Public notification of the public comment period placed in national, state and regional papers.

In addition to this, the activity website, which can be accessed at Home Page | Social Pinpoint (mysocialpinpoint.com.au), was created to provide an open platform for people to raise concerns and stay informed. The website and its content exceed industry standards for consultation to support the delivery of information in a range of formats. The preliminary impact and risk assessment was published as soon as it became available, which included seven concise information summaries. Project updates, a community information session video and webinar recording including Q&As, were also publicly available on the website. An additional 19 relevant persons self-identified by completing the registration survey on the website. A dedicated activity email, PO Box address, and telephone number for communications was distributed on the webpage, in letters and emails, at community sessions, and also included on 12 information sheets and on social media posts.

ConocoPhillips Australia initially undertook drop-in sessions in community. In response to feedback during those sessions, the methodology was adapted to focus on other formats requested by the community (Event ID 1085) and Town Hall style community information sessions were held from thereon. The community-based sessions provided an excellent open format to provide and receive information. The session locations were determined in relation to the EMBA, in areas where relevant persons were likely to be based (i.e., towns with commercial ports), and locations requested and suggested by relevant persons and a local Council during the co-design consultation process. Where appropriate, these sessions allowed ConocoPhillips Australia to tailor the events based on the location. Based on feedback received early in the consultation process regarding consultation fatigue (Event ID: 1823, 2576, 2522) ConocoPhillips Australia also undertook to collaborate with other proponents where possible and appropriate along the Victorian coastline when conducting community information sessions.

The content covered in the two separate rounds of community information sessions was directly relevant to the preparation of EP and provided important information to the public and relevant persons, as listed in Table 3-2 below (see also Figure 3-3).

Table 3-2: Consultation at community information sessions informed the development of the EP

Information Sessions	Content Covered	Regulatory Requirement
Round 1	• Proposed exploration drilling program and activities. • Offshore drilling – explained. • Environmental impacts and risks explained: • Our methodology • Preliminary assessment. • Panel session – questions, answers and feedback.	• 13(1) • 13(2) • 13(3) • 13(4)
Round 2	• Otway Exploration Drilling Program • Otway Exploration Drilling Activities • Consultation to better understand environmental values and sensitivities. • Share your environmental values and sensitivities. • Feedback from consultation. • Environmental impacts and risks. • How our activity interacts with the existing environment. • Panel session – questions, answers and feedback.	• 13(5)(a)(b)(c) • 13(6)

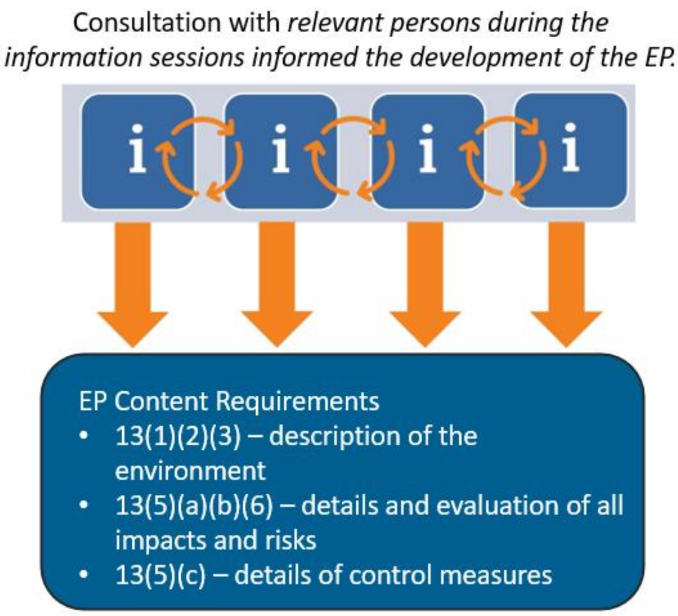


Figure 3-3: Regulatory environmental assessment, informed by two-way information sharing

3.3.2.1. Opportunity to Self-identify

Through the broad capture of people and information, ConocoPhillips Australia created multiple opportunities for relevant persons to self-identify. At the centre of this was the project website 'Otway Exploration Drilling Program', which provided information and interactive communication tools, such as a resource library, Q&A's, the opportunity to self-identify as a relevant person and/or register to receive information about the proposed activity and attend webinars or contribute values and sensitivities through an interactive map.

This promoted an information share, evidenced by the 947 document downloads and 152 responses, with the public and relevant persons. A key feature of the project website was the consultation survey, which helped the public determine if they were considered a relevant person, or request more information, for the purposes of section 25. In total, the website reached over 12,500 people, with more than 150 interactions occurring, which included:

- 23 responses to the consultation survey which assisted potentially relevant persons to self-identify and subsequently identified 18 additional relevant persons.
- 47 individuals registered to receive project updates
- 46 individuals registered to attend webinars.
- 13 discrete pieces of feedback we received via an instant feedback form.
- 2 responses were received providing feedback on the Draft EP chapters.
- 20 discrete comments were left on the interactive map in support of identifying additional values and sensitivities within the Environmental Planning area.

The Consultation Survey facilitated self-identification as it enabled individuals to provide their functions, interests, or activities, or request more information to determine relevancy. A full record of engagement through the website can be found in Appendix C3.

In addition to the website, three geotargeted carousel social and traditional media posts reached more than 8,000 people, and 532 print and radio advertisements were used to publicise the community information sessions that were held to create awareness of the project and the consultation process across local communities. The advertisements also included a QR code that directed people to the project website where they were encouraged to self-identify as relevant persons.

3.3.2.2. Tailored Engagement Methods

Communications were uniquely tailored based on audience, preferred medium and technological availability. During the co-designed consultation process, ConocoPhillips Australia provided sufficient information through requested mediums, enabling individuals to make an informed decision on the possible consequences of the OEDP on their functions, activities, or interests. These mediums included emails, phone calls, face-to-face meetings, tailored presentations, webinars, and website interactions. An outline of the engagement methods used by ConocoPhillips Australia is in (Table 3-7 Engagement Methods) below.

Table 3-3: Engagement methods

Method	Summary	Total Engagement
Community Information Sessions	At each session, the process for identifying as a relevant person was explained and the regulatory process of consultation with relevant persons was also discussed in detail.	213 registered attendees (majority of attendees chose not to register as a relevant person) across 20 sessions.
Contacted Government agencies	Relevant government departments and agencies were identified under sub section 25(1)(a)) using a combination of guidance documents and previous relevant persons lists from ConocoPhillips Australia's Sequoia MMS Environment Plan (Aug. 2021).	35 agencies identified and contacted.
Consulted with local community groups	Reached out to local community groups, such as those focused on environmental conservation or fishing, to identify members whose interests or activities could be affected by the activity	16 community groups contacted.
Consulted with First Nations groups	First Nations groups may have specific cultural or spiritual interests and activities that could be affected by the activity, and meaningful and effective consultation was deemed important to build genuine, ongoing, and effective relations. The methods that were employed are expanded on below.	45 separate First Nations groups contacted.
Local newspaper and radio	Advertised in local newspapers and on local radio stations to notify the public about the planned activity and ask for any persons with	792 advertisements placed across social and traditional media.

Method	Summary	Total Engagement
	specific interests or activities that may be affected by the activity to come forward.	
Contacted Industry Associations	We reached out to industry associations and co-ops related to fishing in the area, to leverage notification to members whose interests or activities could be affected by the activity.	25 Industry Associations contacted.
Contacted Local Businesses	We reached out to local businesses and umbrella organisations such as Chambers of Commerce and tour operators, to engage members and customers through business networks whose interests or activities could be affected by the activity.	43 business contacted.
Contacted local Educational Institutions	We reached out to local educational institutions, such as universities or research centres, to engage with researchers or students whose interests or activities could be affected by the activity.	3 educational institutions contacted.
Social Media (inc. LinkedIn)	We used our corporate social media to post geotargeted carousel notifications that were sponsored to stay posted for 27 days in total, and asked for any persons with specific interests or activities that may be affected by the activity to come forward.	Over 8,000 people reached
Consultation Hub/Project specific website	OEDP website provided information and communication tools as well as a survey to reach out to a wide range of people and assist them to identify as a relevant person. The survey was also used to gather information about their interests and activities that may be affected by the activity. A second feedback survey was conducted to assist relevant persons and the public to provide feedback on the draft EP chapters prior to submission to the independent regulator, NOPSEMA.	Total of 12,778 visits, with 4258 unique users who interacted on the consultation hub 1095 times by taking RP surveys, registering for updates and expressing feedback and downloading documents.
Hosted industry-specific briefings and events.	We hosted events and briefings for local business groups and industry-specific operators e.g., commercial fishers and King Island Regional Development Organisation, to widen the reach of relevant persons who may be affected by the activity.	5 events and briefings held.

3.3.3. Reasonable Period of Raising Awareness

According to sub section 25(3) of the OPGGE(S)R, titleholders must allow all relevant persons a reasonable period for the consultation. ConocoPhillips Australia took that to mean both a reasonable period of raising awareness about the activity, and a reasonable period with sufficient information (discussed at 2.6). ConocoPhillips Australia commenced consultation with relevant persons formally on 3 February 2023, over 250 days before first submission to NOPSEMA. This process commenced with a general notification to relevant persons initially identified by the process outlined in Section 3.3.

3.3.4. Statutory Categories

In undertaking an assessment of the relevant persons, and to inform what constitutes sufficient information under the OPGGS(E)R, each relevant person was classified according to the categories outlined in Table 3-4 Information category and associated levels of engagement below. These categories align and reflect the intentions of section 25.

Table 3-4: Information category and associated levels of engagement

Regulation Section	Description	Strategy
25(1) (a)	Regulatory agency of the Commonwealth who has legislated requirements or decision-making powers.	ConocoPhillips Australia will follow NOPSEMA'S guidance in preparing the OEDP EP and will seek advice, as required during the development process. ConocoPhillips Australia will accept the decision of NOPSEMA about whether it has done enough to demonstrate that the requirements of the regulations have been met.
25(1) (a); (b); (c)	Regulatory agencies who have legislated requirements, including Commonwealth and State Departments or Agencies or the Department of the responsible Commonwealth or State Minister.	Adopt a co-design approach for targeted consultation specific to relevant persons, legislation, regulations or guidance. Follow up to ensure receipt and seek feedback.
25(1) (d)	Relevant persons or organisations whose functions, interests or activities may be affected by the activities to be carried out in the OEDP EP. High interest and/or response actions.	Adopt a co-design approach for targeted consultation specific to relevant persons and organisations. Follow up to ensure receipt and seek feedback.
25(1) (e)	Relevant persons with low interest (confirmed) or any other person or organisation that ConocoPhillips Australia considers relevant.	Generic consultation material to ensure awareness and knowledge of proposed OEDP activities and channels and opportunities to provide feedback. No follow-up to ensure receipt or seek feedback.

3.3.4.1. Section 25 (1)(a), (b) and (c)

Identifying relevant government agencies and statutory authorities. The list of these relevant persons can be found at Appendix C1, excluding those that requested their information be maintained as confidential.

3.3.4.2. Section 25 (1)(d) and (e)

Pursuant to the OPGGS(E)R, Federal Court and NOPSEMA guidelines, the terms "functions", "interests" and "activities" are defined as follows:

"functions"

- Refers to "a power or duty to do something".

"interests"

- To be construed as conforming with the accepted concept of "interest" in other areas of public administrative law. Includes "any interest possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relations to reputation".

"activities"

- To be read broadly and is broader than the definition of 'activity' in section 5 of the Environment Regulations and is likely directed to what the relevant person is already doing.

Figure 3-4 Consultation approach for relevant persons 25 (1)(d) and (e) below demonstrates the approach ConocoPhillips Australia implemented to identify relevant persons under these subcategories. Any list of relevant persons in this category is non-exhaustive. ConocoPhillips Australia understands that this list can expand and contract as the activity develops, and newly identified relevant persons will be acknowledged and consulted with as part of ConocoPhillips Australia' ongoing consultation process, outlined in Section 3.10.

When consulting with groups where interests are held communally, for example, with First Nations People/groups and commercial fishers, a tailored, fit-for-purpose method of consultation is adopted to reasonably reflect the characteristics of the interests affected by the proposed activity (see Appendix C4: First Nations Consultation Report and Appendix C5: Commercial Fishers Consultation Report).

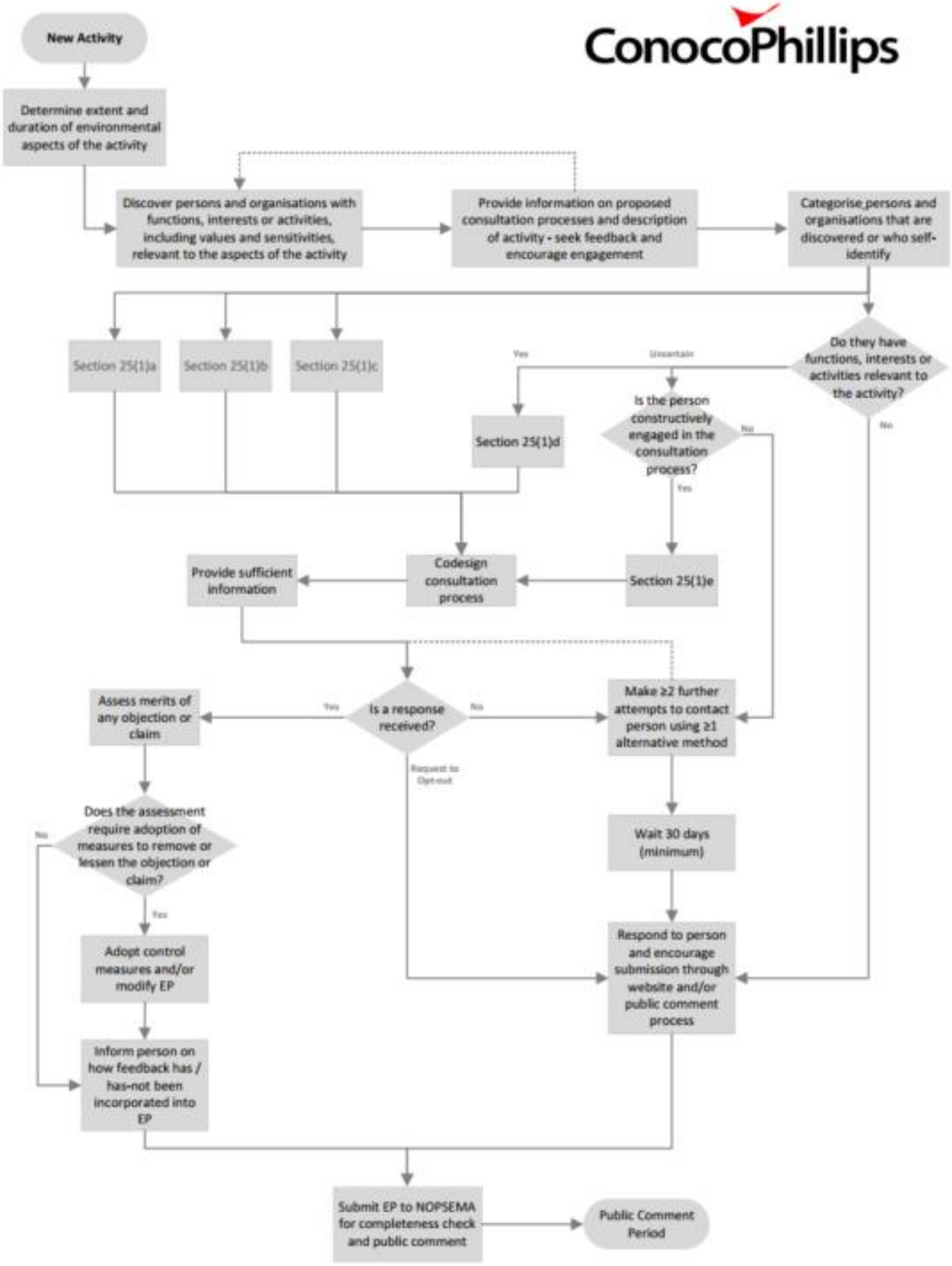


Figure 3-4: Consultation approach for relevant persons 25(1)(d) and (e)

3.3.5. First Nations Australians Overview

ConocoPhillips Australia commissioned a cultural heritage specialist (Biosis) to explore regional cultural heritage and cultural heritage landscapes to support a grounding in Aboriginal cultural heritage including Country and Sea Country. The intent of the commissioned study, included in Appendix L, was to form the basis for gaining an understanding of cultural values and sensitivities, to inform consultation and support the preparation of the Environment Plan.

ConocoPhillips Australia then undertook additional and extensive desktop research to identify other relevant First Nations groups or organisations whose functions, interests and activities may be affected by the proposed activity, and they were invited to participate in the Division 3 consultation process.

ConocoPhillips Australia has made extensive efforts to consult with the Traditional Owner communities in the region, to further inform the impact assessment on cultural features of the environment planning area. These efforts included a cultural landscape tour, visits to significant local sites, engagement with First Nations people whom we met whilst on Country, broad scale awareness raising activities, and targeted consultation efforts such as connecting via online social networking.

ConocoPhillips Australia invited both specific individuals and the public, including Traditional Owners, to share environmental knowledge to improve the predictive quality of the impact assessments.

ConocoPhillips Australia advertised public consultation on the Draft Environment Plan in First Nations print and electronic media, namely the National First Nations Times, the Koori Mail, and live reads on Koori Radio.

ConocoPhillips Australia has committed to implementing a Cultural Heritage Protection Program which includes protective measures for Sea Country and invites the co-design of measures that will sufficiently protect the cultural features of the environment. This includes provision for adaption, should more detailed information about cultural features of the environment reveal themselves (refer to sections 10.2.5.1 and 10.2.7).

Full details of ConocoPhillips Australia’s approach to consultation with First Nations Australians and a list of identified First Nations relevant persons is detailed in Appendix C4: First Nations Consultation Report.

3.3.6. Commercial Fishers Overview

ConocoPhillips Australia commercial fishing measures were identified and informed through engagement with commercial fishers and their representative organisations who operate in the activity area. The process followed the fundamentals underpinning ConocoPhillips Australia’s consultation efforts but allowed for a tailored approach to achieve a broad capture of fishers and fisheries, unique engagement and project planning, and provision of sufficient information specific to the relevant persons needs.

This process also facilitated two-way information sharing between ConocoPhillips Australia and the relevant persons, allowing the activity to be co-designed with measures in place to minimise any potential impacts.

Full details of ConocoPhillips Australia’s approach to consultation with Commercial Fishers and a list of identified relevant Commercial Fishers is detailed in Appendix C5: Commercial Fishers Consultation, excluding those that requested their information be maintained as confidential.

3.4. Relevant Persons Identified

In the process of consultation, over 1240 individuals and groups were contacted during the preparation of this EP. Of these individual points of contact, 575 relevant persons were identified, full details of these persons can be found in Appendix C1, excluding those that requested their information be maintained as confidential.

3.5. Provide Sufficient Information

According to section 25(2) of the OPGGE(S)R, titleholders are required to provide relevant persons with sufficient information to allow them to make an informed assessment of the possible consequences of the proposed activity on their functions, activities, and interests.

Prior to submission of this EP, ConocoPhillips Australia carried out an audit of whether relevant persons had been provided sufficient information relevant to the functions, interests, and activities, of the relevant person using the following criteria:

- The information provided was in a format that was accessible to the relevant person.
- The information provided was at the appropriate level of detail.
- The information was provided using an appropriate method (e.g., letter, email, phone call etc.)
- The process of reaching sufficient information was iterative.

3.5.1. Format of the Information

Information was provided to relevant persons in various formats either as requested through co-design of the consultation process, and/or because of feedback from a relevant person, and having considered the functions, interests, and activities of relevant person. Table 3-5 lists the different information provided and the format that the information was provided in.

Table 3-5: List of information provided and the format it was provided in

Name	Released	Format	Description
Consultation	February 2023	Information Sheet 1	This Information Sheet provided an overview on how ConocoPhillips Australia proposed to undertake consultation in the development of the EP.
Proposed Exploration Activity 2024-2028	February 2023	Information Sheet 2	This Information Sheet provided an overview of the proposed ConocoPhillips Australia Otway Exploration Program
Legislative and Other Requirements	April 2023	Document	This document captured the legislative and other requirements that apply to the activity.
Preliminary Impact and Risk Assessment	April 2023	Document	This document provided the preliminary assessment of all the environmental impacts and risks ConocoPhillips Australia have to manage.
Project Update May 2023	May 2023	Information Sheet 3	This information sheet summarised the next phase of the Environment Plan development and consultation.
Commercial Fishing	May 2023	Information Sheet 4	This information sheet summarised the ongoing assessment of potential impacts and risks to the commercial fishing industry.
Emissions and Discharges	May 2023	Information Sheet 5	This information sheet summarised the ongoing assessment of potential impacts and risks arising from air emission sand planned discharges.
Seabirds, Penguins and Marine Turtles	May 2023	Information Sheet 6	This information sheet summarised the ongoing assessment of potential impacts and risks to seabirds, penguins, and marine turtles.
Other Marine and Coastal users	May 2023	Information Sheet 7	This information sheet summarised the ongoing assessment of potential impacts and risks to other marine and coastal users.
Marine mammals	May 2023	Information Sheet 8	This information sheet summarised the ongoing assessment of potential impacts and risks to mammals.

Name	Released	Format	Description
Historical Military Ordnance Risk (Unexploded Ordnance Risk)	May 2023	Information Sheet 9	This information sheet summarised the ongoing assessment of the risk of interaction between vessels or equipment associated with the Otway Exploration Drilling Program and any historic defence activities in the operational area.
Otway Exploration Drilling Program Community Information Session	May 2023	YouTube Video	This is a recording of the Information Session held on King Island on 18 May as part of the ConocoPhillips Australia Otway Exploration Drilling Program consultation process.
Otway Exploration Drilling Program Webinar 1	May 2023	YouTube Video	This is the first Webinar as part of the ConocoPhillips Australia Otway Exploration Drilling Program consultation process.
Project Update June 2023	June 2023	Information Sheet 10	This information sheet summarised the next phase of our Environment Plan development and consultation.
Otway Exploration Drilling Program Webinar 2	July 2023	YouTube Video	This is the second Webinar as part of the ConocoPhillips Australia Otway Exploration Drilling Program consultation process.
Project Update August 2023	August 2023	Information Sheet 11	This information sheet summarised the next phase of our Environment Plan development and consultation.
Unplanned Hydrocarbon Release	August 2023	Information Sheet 12	This information sheet summarised the assessed risk and response planning required for an unplanned hydrocarbon release as part of the proposed activity.
ConocoPhillips Australia Drilling Overview	September 2023	YouTube Video	This is an animated overview of the exploration drilling process undertaken in offshore Australia.

3.5.2. Methods of Delivery of Sufficient Information

The initial information provided was broad, simple, and easily accessible to the public to engage and capture the maximum number of relevant persons. Once groups and individuals were identified, they were consulted regarding their preferred communication method, and this helped co-design the consultation process considering the functions, interests, and activities of the relevant person.

Table 3-6 lists the methods of delivery used by ConocoPhillips Australia and provides examples of the information provided using that method. This demonstrates that the method of delivery of sufficient information was tailored to the relevant persons functions, interests, and activities.

Table 3-6: Examples of information provided to relevant persons through various methods

Method of delivery	Summary of Information Provided
Letters (registered)	Registered letters were sent to relevant persons when correspondence needed to be tracked to ensure receipt e.g., mailout to commercial fishers. See Appendix C1.
Letters	Formal letters were used to correspond with relevant persons during consultation when formal documentation was warranted. See Appendix C1.
Email and telephone	Email and telephone were used to consult with relevant persons as part of the development of the EP.
Draft reports/EP chapters	The Draft Preliminary Impact Assessment was published on the project website; relevant persons were notified and invited to provide feedback and raise objections and concerns that informed the management of impacts and risks and proposed control measures.
Otway project website	A project website was created which included a Consultation Hub and a document library. All Project Updates, reports, draft EP chapters, information sheets, webinar recordings etc were available on the external website.

Method of delivery	Summary of Information Provided
Interactive map	An interactive map of the environmental planning area is hosted on the project website/consultation hub, and relevant persons are encouraged to pin a location of environmental value or sensitivity. Twenty-three comments have been received to date.
Information sheets	Twelve information sheets were developed and published in accordance with section 25(2) to ensure the proposed activities were adequately described, including impacts and risks, as part of a suite of information that enabled relevant persons to make an informed assessment of the possible consequences of the activity on their functions, interests or activities. The information sheets were issued to relevant persons and were available at community information sessions (as they were produced). They were also available for interested persons on the external website. These information sheets can be found in full in Appendix C3.
EP Summary	Information Sheet 13 provided a detailed summary of the entire Environment Plan. This can be found in in Appendix C3.
Webinars	Three webinars were hosted at each consultation milestone: • Webinar 1 – Establishing Context • Webinar 2 – Environmental Impact and Risk Assessment • Webinar 3 – Initial Environment Plan Content Available • Webinar 4 – Next steps as the EP is submitted for Public Comment Webinars 1, 2 and 4 were recorded and uploaded to the project website; technical difficulties precluded this for webinar 3, but a briefing and/or copy of the presentation was offered instead.
Community Information Sessions	17 Community Information Sessions (see content and location details at Table 3-7)
Online meetings	39 virtual meetings for online briefings, presentations and consultation with relevant persons and organisations.
Face-to-face meetings	21 in-person meetings for briefings, presentations and consultation with relevant persons and organisations.

3.5.3. Appropriate Level of Detail

ConocoPhillips Australia acknowledges that different relevant persons have different expectations about the level of detail they require to be able to make an informed assessment of the possible consequences of the activity on their functions, interests, and activities. ConocoPhillips Australia used a variety of different levels of detail throughout the consultation process to tailor the level of detail to the relevant person’s needs. As part of the co-design process relevant persons were asked if they required more detail than had been provided.

For example, 13 individual information sheets were prepared relevant to environmental aspects, receptors, impacts, or risks and these were provided to relevant persons. In a further example, a preliminary impact and risk assessment was prepared to cover all impacts and risks in a summary form so that relevant persons had a complete picture of how they may be affected and could ask for more information.

As a final measure, ConocoPhillips Australia has made all the information made available for any relevant person available on the Consultation Hub website. This included draft EP chapters (i.e., the full detail) being available to the public and each relevant person. This measure was taken to ensure that if we had provided a summary of information to a relevant person and they wanted further information they would be able to obtain all the information they need. Instructions on accessing this information was provided to relevant persons. The information available on the Otway Exploration Drilling Program website is listed in Table 3-5 and is available in full in Appendix C3. The full EP chapters being published was not taken to have met the sufficient information requirement on its own. Rather, it ensures that the full detail was available to each relevant person if they so needed that level of detail.

3.5.4. Iterative Process for Reaching Sufficient Information

By adopting an iterative, collaborative approach to the provision of information, ConocoPhillips Australia has exceeded the requirement to provide relevant persons sufficient information and to allow an informed assessment of any possible effects of the activity on their functions, interests, or activities. When a relevant person requested further information, it was promptly provided by ConocoPhillips Australia (for example see Stakeholder ID: 657). The iterative nature of the consultation process is demonstrated best were there were multiple occasions where information, questions, and feedback were exchanged between ConocoPhillips Australia and relevant persons.

3.6. Reasonable Period for Consultation

According to section 25(3) of the OPGGE(S)R, titleholders must allow all relevant persons a reasonable period for the consultation. ConocoPhillips Australia took that to mean both a reasonable period of raising awareness about the activity, and a reasonable period with sufficient information.

3.6.1. Reasonable Period with Sufficient Information

A notification about the release of the draft EP chapters was sent on 24 August 2023 via email to all identified relevant persons and people subscribed to receive updates, which included project update information sheet 11. At this time, selected draft EP chapters were available online. The release of draft EP chapters was also advertised in national and regional print media and on regional radio in two schedules (see advertising schedule at Appendix C3).

All draft EP chapters and technical reports were available from 31 August 2023, to allow all relevant persons to provide feedback and to ensure they can make an informed assessment of the possible consequences on their functions, interests, or activities. The intent of this was to provide the opportunity for all relevant persons to seek more information, or to raise objections or claims for consideration on merit, in advance of finalising the EP for submission to NOPSEMA, following public comment. All requests for an extension of time beyond 30 days were considered and assessed for merit on a case-by-case basis and granted accordingly. ConocoPhillips Australia provided additional information and remained engaged with relevant persons to help assess all feedback, objection or claims provided. A summary of information provided to relevant persons and the period they had to consider that information is provided in Figure 3-2.

3.7. Relevant Person Input into Environmental Management

Another expectation of the titleholder is to use consultation and feedback to inform and improve the predictive quality of the impact and risk assessments, and to validate or improve the environment protection measures. ConocoPhillips Australia employed various methods to engage relevant persons and solicit feedback on how the activity may affect their interests, activities, or functions. These methods were customised to different groups and individuals to ensure that feedback was encouraged and facilitated appropriately. There were several feedback channels available to relevant persons, including face-to-face and virtual meetings, phone calls, emails, and the website.

Relevant persons were encouraged to provide comment within a 30-day period from receipt of any update or information. Comments provided outside of this time were still considered and incorporated into the approvals process. The criteria used to determine if a reasonable opportunity, sufficient information, and a reasonable period had been provided, and no further engagement was required included:

- If no response was received following this period from section 25(1)(a), (b), and (c) category or relevant persons, on a case-by-case basis, they were followed up via telephone and if no further response was received, then it was considered that no comment was to be provided and it was closed out until further notification if applicable.

- If a response was received from a section 25(1)(a), (b), and (c) category relevant persons, it was assessed for merit and then a response provided to the relevant person.
- If no response was received this was then closed out until further notification if applicable.

For section 25(1)(d) relevant persons, direct follow up was undertaken on a case-by-case basis, even if no response was received following initial engagement, to ensure receipt and seek feedback. Criteria to determine if a reasonable opportunity, sufficient information, and a reasonable period had been provided included:

- The relevant person acknowledged ConocoPhillips Australia's response and they were satisfied with the way their concerns had been addressed.
- The relevant person was not satisfied with how the comments were addressed but were made aware of how their views were being reflected to NOPSEMA and how ConocoPhillips Australia was responding to them.

A common misunderstanding from relevant persons was that their consent was required for the activity to proceed. In these circumstances, ConocoPhillips Australia provided clarification to relevant persons of their rights under section 25 and sent them NOPSEMA brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)].

3.7.1. Tailored and Appropriate Feedback

In addition to the publicly available information, ConocoPhillips Australia understood that different relevant persons require different channels of feedback with varying information requirements. Rather than burdening relevant persons with the task of filtering information, feedback was tailored so that they received the sufficient information required to make informed decisions, in a manner most appropriate to them. For example, Government agencies were predominantly contacted via email with monthly project updates. Comparatively, some First Nations organisations requested face-to-face meetings on Country, this was accommodated for as ConocoPhillips Australia recognised and respected cultural values. Summary and full text responses demonstrating tailored feedback can be found in Appendix C1 and Appendix D.

3.7.2. Tailored Consultation for King Island in Response to EMRS (2021) Survey

In 2021, the Wilderness Society (ORG ID: 524) commissioned independent polling company EMRS to conduct an island-wide survey on King Island regarding the Sequoia 3D Marine Seismic Survey (FULL TEXT COPY of survey report and results is presented in Appendix C3). Many members of the King Island community requested we respond to the survey when we started consultation for the Otway Exploration Drilling Program (Event ID: 1085, 1304). In response to these requests, ConocoPhillips Australia undertook to re-review the survey. Subsequent assessment identified how consultation on King Island could be adapted considering survey findings, the following modifications were made to consultation:

- Community Awareness: The EMRS (2021) survey identified that 50 per cent of the respondents (~268 individuals) were aware of the Sequoia 3D MSS. To increase awareness and potential relevant person identification for the proposed Otway Exploration Drilling Program, ConocoPhillips Australia worked with King Island vendors to facilitate an island wide letterbox drop to all households inviting all residents to all community information sessions hosted on the island. This information also included QR code link to the project website where recipients could learn more about the proposed activity. ConocoPhillips Australia also increased the frequency of radio advertisements promoting the sessions to support community awareness.
- Use of marine environment: The EMRS (2021) survey identified that 74 percent of respondents used the marine environment for recreation whilst 66 per cent of respondents used the marine environment for recreational fishing, highlighting there were 354-398 potentially relevant individuals on the island. In addition to the efforts outlined above, ConocoPhillips Australia reviewed historic consultation lists and undertook additional desktop reviews and investigations to identify additional possible recreational groups and clubs on the island that might wish to be consulted. This resulted in some group-specific

consultation (Org ID: 513, King Island Development Organisation, Org ID: 619, Event ID: 2377) but was not broadly adopted/taken up.
- Decision-making process: The EMRS (2021) survey identified that 15 percent of respondents (~80 individuals) believed they had a say in the decision-making process for the Sequoia 3D MSS. Although consent is not a requirement under Division 3, ConocoPhillips Australia used relevant person consultation to identify values and sensitivities and help inform assessments in the preparation of this EP. This EP had over 250 changes made in response to feedback from relevant persons, and close to 850 references to feedback (Events/Reg16bs) that took place during consultation.

3.8. Appropriate Measures Adopted

3.8.1. Assessment of Merit

The merit of all feedback, objections and claims received from relevant persons during consultation was assessed in line with Table 3-7 Merit of objections and claims. A record of all objections and claims received, the assessment of merit, and the response provided is included in Appendix C2.

Table 3-7: Merit of objections and claims

Low Merit	High Merit
Objection or claim is not about the project or any activity within the project i.e., outside the scope of the Environment Plan. Objection or claim is not about the adverse impacts of the activity i.e., outside the scope of the Environment Plan.	Objection or claim is about the project or any activity within the project. Objection or claim is about an adverse impact of the activity. The adverse impact to which the objection or claim relates has already been considered in the EP, and ConocoPhillips Australia has undertaken a review to ensure it has been adequately assessed. Objection or claim is not already considered in the EP and is of sufficient merit to alter the content of the EP to reflect the response – could be additional information about the environment or a change in the environmental management of the project.

ConocoPhillips Australia has advised each relevant person that raised the objection or claim of the outcome of this process, including whether the objection or claim was substantiated, how it was assessed, and what, if any, controls were put in place to manage the impact or risk to ALARP and an acceptable Level. This process of information exchange, assessment and response is ongoing for the duration of the activity.

3.8.2. Input Used and Measures Adopted

According to the guidelines set by NOPSEMA (GL2086), a primary objective of consultation under regulation section 25 of Division 3 is to ensure that authorities, organizations, and relevant individuals who may be affected by activities carried out by the titleholder are consulted, and their input is used to inform the development of environment plans where appropriate. ConocoPhillips Australia received several communications that helped to enhance our understanding of the environmental values and sensitivities that could be affected by the activity. These communications and their implementation can be found in Appendix C2. ConocoPhillips Australia informed each relevant person of the measures that were taken to mitigate the adverse environmental effects that the petroleum activity may otherwise cause.

There were 440 occasions where ConocoPhillips Australia responded to individual items of feedback (FB), including objections and claims received through consultation. Of these 440 items, 195 were in response to claims, 39 were in response to objections (or objections associated with claims or request), 59 were associated with requests (typically for more information), 23 were associated with statements, 65 were classified as other and 59 were classified as not within the scope of the EP. Table 3-13 below summarises the occasions where measures were adopted in response to feedback specific to the consultation process.

Table 3-8: Consultation measures adopted

Request	Event ID	FB ID	Measure Adopted
ConocoPhillips take the survey undertaken by EMRS of King Island residents into consideration for consultation?	2512	181	EMRS Survey about the sequoia seismic survey and community sentiment was considered in this chapter and can be seen in full at appendix C3.
Questions regarding the effectiveness of consultation mediums.	2512	185	Use of multiple methods and tools to support consultation, from in community discussions through to webinars and animations.
Questions regarding the engagement with youth/seniors on King Island.	2512	183	Consultation included a range of methods from in-community discussions through to webinars and animations. ConocoPhillips has been responsive to requests for changes in approach, e.g. drop-in sessions to town hall style briefings at different times of day.
Recommended advertising through the Portland Observer.	2575	119	Advertisements were run in the Portland Observer when promoting community information sessions or other information. See Appendix C3 for full details of advertisements.
Feedback that not everybody could attend an evening community session on King Island.	1085	443	ConocoPhillips Australia hosted two sessions on 13 July, one AM and one PM session to allow more members of the community an opportunity to attend.
Recommendation that a sign needed to be out the front for community sessions, so people knew where it was hosted.	1085	442	A sign was taken to all future information sessions in community from 15/03.
Objection that community sessions are inaccessible and recommendation they're changed to town halls.	1085	440	ConocoPhillips Australia commenced holding information sessions (town halls) from May 2023 to provide information about the proposed activity to interested community members to support the identification of relevant persons.
Claim that sufficient time is not given to digest and provide meaningful consultation based on the times outlined.	2450	70	Consultation process was extended on two occasions. A period of consultation significantly longer than industry norms was afforded.

A record of all measures adopted is included in Appendix C2 and D.

3.9. Public Comment

The Public Comment period commenced on 16 November 2023 for a 30-day period, closing on 18 December 2023. During this time 11,440 submissions were made to NOPSEMA about the Otway Exploration Drilling Program Environment Plan (EP). ConocoPhillips Australia established a rigorous process to ensure that adequate consideration was given to each public comment submission.

Full details of ConocoPhillips Australia's approach to public comment is included in Appendix C6: Public Comment Report, and extensive responses to public comments are provided in the Titleholders Report on Public Comment available on NOPSEMA's website, excluding information provided by persons who requested their information be maintained as sensitive.

3.10. Record Keeping

A confidential database of relevant persons was created and maintained using Consultation Manager to ensure accurate record-keeping. ConocoPhillips Australia stores all consultation records on Consultation Manager, which is an ISO27001/9001 compliant product. Viewing access is only granted to authorised persons by ConocoPhillips Australia' authorised Administrator.

3.11. Ongoing Consultation

Section 22 (15) of the OPGGS(E)R mandates that a titleholder's implementation strategy must include ongoing consultation. ConocoPhillips Australia's implementation strategy includes ongoing consultation procedures that are in place to manage and fulfil this requirement (see Ongoing Relevant Person Consultation at 10.2.5 in the Implementation Strategy). The goals of these procedures are to achieve the following over the lifecycle of the project:

- Identification of additional relevant persons that may be affected by the OEDP activities.
- Continuation of two-way meaningful dialogue with relevant persons.
- Provision of sufficient information to all relevant persons.
- Adjustment protocol principles to compensate impacted fishers in appropriate circumstances.
- Ongoing identification and resolution of issues identified by relevant persons.
- Adaptive risk management that reflects new knowledge and understanding acquired over the life of the EP.

ConocoPhillips Australia uses Consultation Manager to maintain an updated list of relevant individuals and organisations and provide them with new information, project development notices, and updates on any changes that may affect their functions, interests, or activities. Each relevant person has their preferred medium of communication, which was previously established during the co-design process. However, this can be altered to suit the relevant person's needs. Those who identify as relevant persons after the EP submission will be communicated with under this ongoing consultation process.

In managing feedback, complaints, objections, disputes and grievances, ConocoPhillips Australia uses the relevant person enquiry, complaint, dispute and grievance procedure, shown in Figure 3-5, to set a minimum standard for timely response to relevant persons. In the event feedback relates to a new or significant increase in existing impact or risk, a revised EP will be submitted to NOPSEMA for assessment in accordance with the OPGGS(E)R section 39(2).

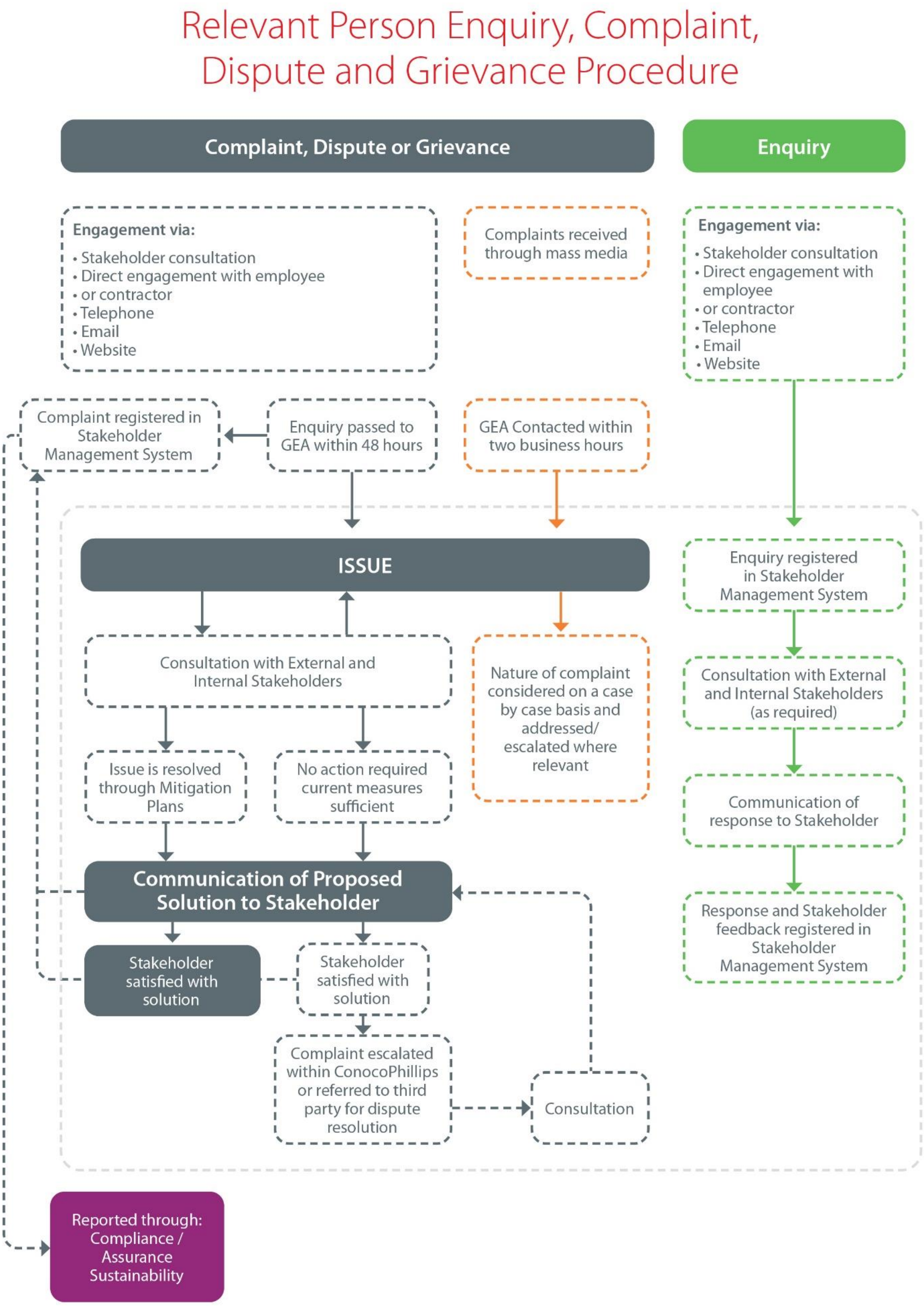


Figure 3-5: Relevant person enquiry, complaint, dispute and grievance procedure

4. Description of the Environment

4.1. Environment that May Be Affected (EMBA)

In accordance with section 21(3) of the Environment Regulations, the 'Environment that may be affected' (EMBA) by the Otway Exploration Drilling Program is described in this section. The EMBA is the term used consistently to describe where a change in the ambient environment condition has the potential to occur as the result of a planned activity or an unplanned event. It is noted that a change does not always imply that an adverse impact will occur. For example, a change may be required over a particular exposure value or over a consistent period of time for an impact to occur.

For the purpose of this EP, the description of the environment is based on the largest predicted spatial extent that hydrocarbon could extend, being the loss of well control (LOWC) low threshold EMBA. This area has been identified through oil spill modelling which uses a combination of floating, dissolved and entrained hydrocarbon contours to predict the geospatial extent. Modelling provides an informed estimate of where the hydrocarbons might go if nothing is done to respond and enables the prediction of possible effects. As physical conditions like currents, wind, waves and temperature are always changing, stochastic modelling is undertaken whereby hundreds of hypothetical spills are simulated under different conditions based on historic data for the area. The output from each of the individual simulations is then overlain to produce the LOWC low threshold EMBA. It is important to note that the low thresholds used are not ecologically significant and have no observable effect on sub-surface waters, or flora and fauna.

The LOWC low threshold EMBA also informs the establishment of an Environmental Planning Area which is used to support consultation. The LOWC low threshold EMBA and Environmental Planning Area in no way represent the actual extent of any single spill, but rather, they establish the area within which ConocoPhillips Australia undertakes to identify environmental values, sensitivities and persons with functions, interests or activities that may be affected by the proposed exploration program.

Environmental values and sensitivities, including specific receptors, may be more sensitive to certain aspects of the exploration program than they are to others. For example, impacts like light and noise are known threats to species such as marine turtles. In order to properly assess the impacts these aspects will have on receptors, the description of the environment identifies receptors located within the spatial extents where aspects may have an impact. EMBAs identified within this section are detailed in Table 4-1.

Table 4-1: Spatial extents used to identify sensitive receptors within the environment

Spatial Extent	Detail/Basis of EMBA	Figure/Sources
Operational Area	Two Operational Areas: • T/49P • VIC/P79	Figure 4-1
Continuous Sound Emissions		
2 km EMBA around drilling activities for injury to fish and marine turtles	Maximum distance within which: • Recoverably injury and TTS may occur in fish, and • PTS and TTS may occur in marine turtles.	Figure 4-2 Underwater sound modelling (Appendix G)
3.59 km EMBA around drilling activities for injury to marine mammals	Maximum distance within which: • TTS in marine mammals may occur (based on results for low-frequency cetaceans).	Figure 4-2 Underwater sound modelling (Appendix G)
12.6 km EMBA around drilling activities for behavioural disturbance to marine mammals on-shelf	Maximum distance within which: • Behavioural disturbance to marine mammals may occur during drilling at on-shelf locations.	Figure 4-2 Underwater sound modelling (Appendix G)

Spatial Extent	Detail/Basis of EMBA	Figure/Sources
22.8 km EMBA around drilling activities for behavioural disturbance to marine mammals on shelf-edge	Maximum distance in the offshore direction, within which: • Behavioural disturbance to marine mammals may occur during drilling at shelf-edge locations.	Figure 4-2 Underwater sound modelling (Appendix G)
Sub-bottom Profiling (SBP) Impulsive Sound Emissions associated with seabed surveys		
500 m EMBA around seabed survey activities for injury and behavioural disturbance *assessed under the 2 km buffer	Conservative distance which includes the maximum spatial extent of impacts to: • Cetaceans (Injury – TTS), and • Southern right whales (behavioural disturbance).	Figure 4-3 Underwater sound modelling (Appendix G)
Vertical Seismic Profiling (VSP) Impulsive Sound Emissions – associated with well testing limited to 20 hrs per well, max. 6 wells		
2 km EMBA around VSP activities for injury	Conservative distance which includes the maximum spatial extent of impacts to: • Marine invertebrate (no effects) • Fish, fish eggs and larvae (recoverable, mortality and TTS) • Marine turtles (behaviour, PTS and TTS) • Marine mammals (behaviour)	Figure 4-3 Underwater sound modelling (Appendix G)
2.5 km EMBA around VSP activities for Injury to Marine Mammals *assessed under the 6.5 km buffer	Conservative distance which includes the maximum spatial extent of impacts to: • Cetaceans (TTS and PTS).	Figure 4-3 Underwater sound modelling (Appendix G)
6.5 km EMBA around VSP activities for behavioural disturbance to SRWs	Conservative distance which includes the maximum spatial extent of behavioural disturbance to: • Southern right whales.	Figure 4-3 Underwater sound modelling (Appendix G)
Artificial Light Emissions		
Light EMBA (20 km)	Based on the National Light Pollution Guidelines for Wildlife of 20 km from each operational area	Figure 4-4
Flaring EMBA (50 km)	Based on assessment of modelling results to 0.001 Lux (50 km) from each operational area	Figure 4-4
Accidental Hydrocarbon Releases		
Marine Diesel Oil (MDO) spill (moderate threshold)	Actionable threshold where environmental harm may occur MDO – moderate thresholds	Figure 4-5
MDO spill (low threshold)	Monitoring threshold where environmental harm is not considered to occur MDO – low thresholds	Figure 4-5
Loss of Well Control (LOWC) event (moderate threshold)	Actionable threshold where environmental harm may occur LOWC – moderate thresholds	Figure 4-6
LOWC (low threshold)	Monitoring threshold where environmental harm is not considered to occur LOWC – low thresholds	Figure 4-6
EMBA	Largest predicted spatial extent that hydrocarbon could extend in any direction. NOTE: Does not reflect the outcome from any single spill event, but rather the cumulative outline of 1400 hypothetical spills.	Figure 4-7

*For the purpose of the existing environment chapter the most conservative values have been used.

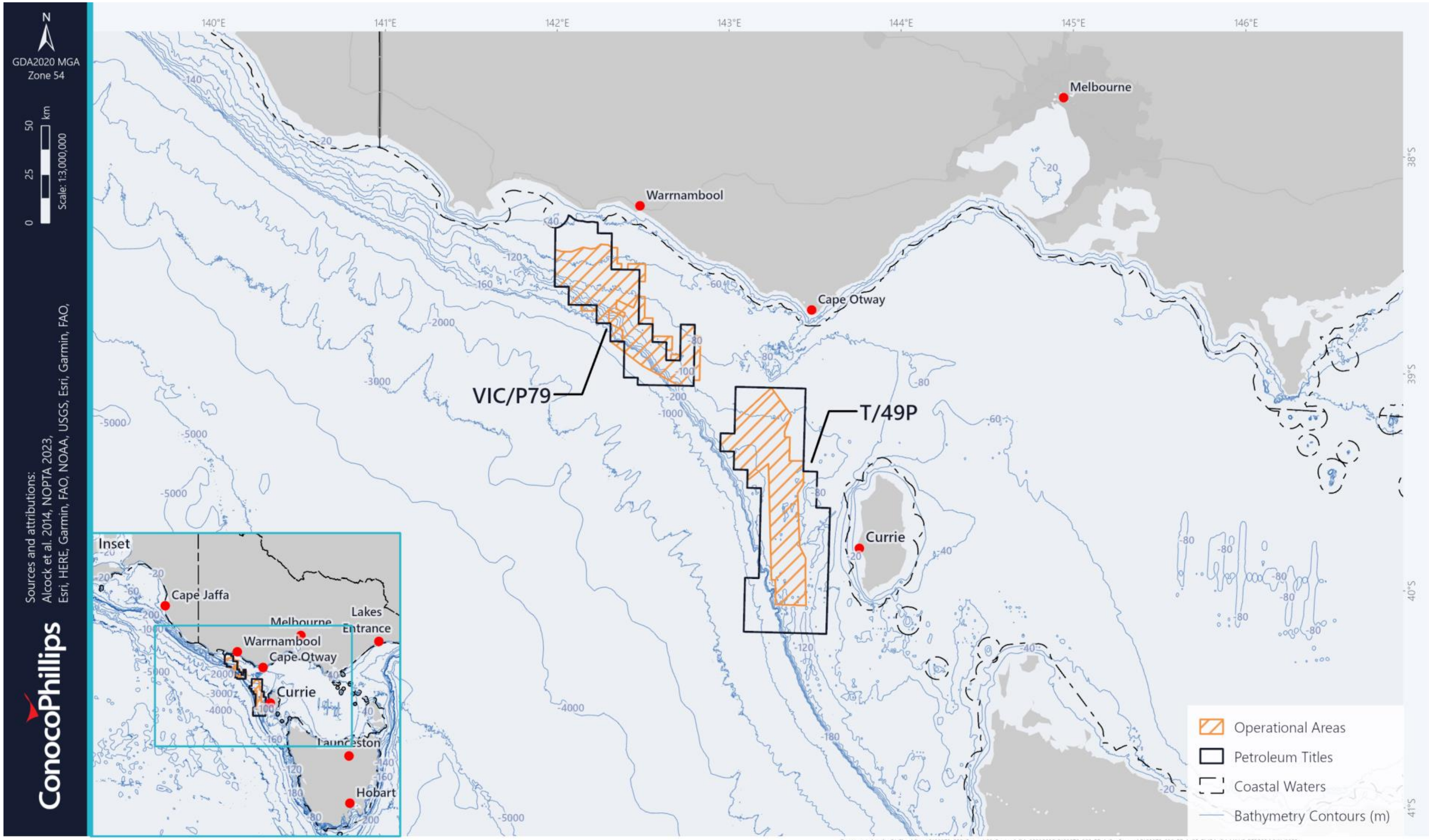


Figure 4-1: Otway Exploration Drilling Program Operational Areas

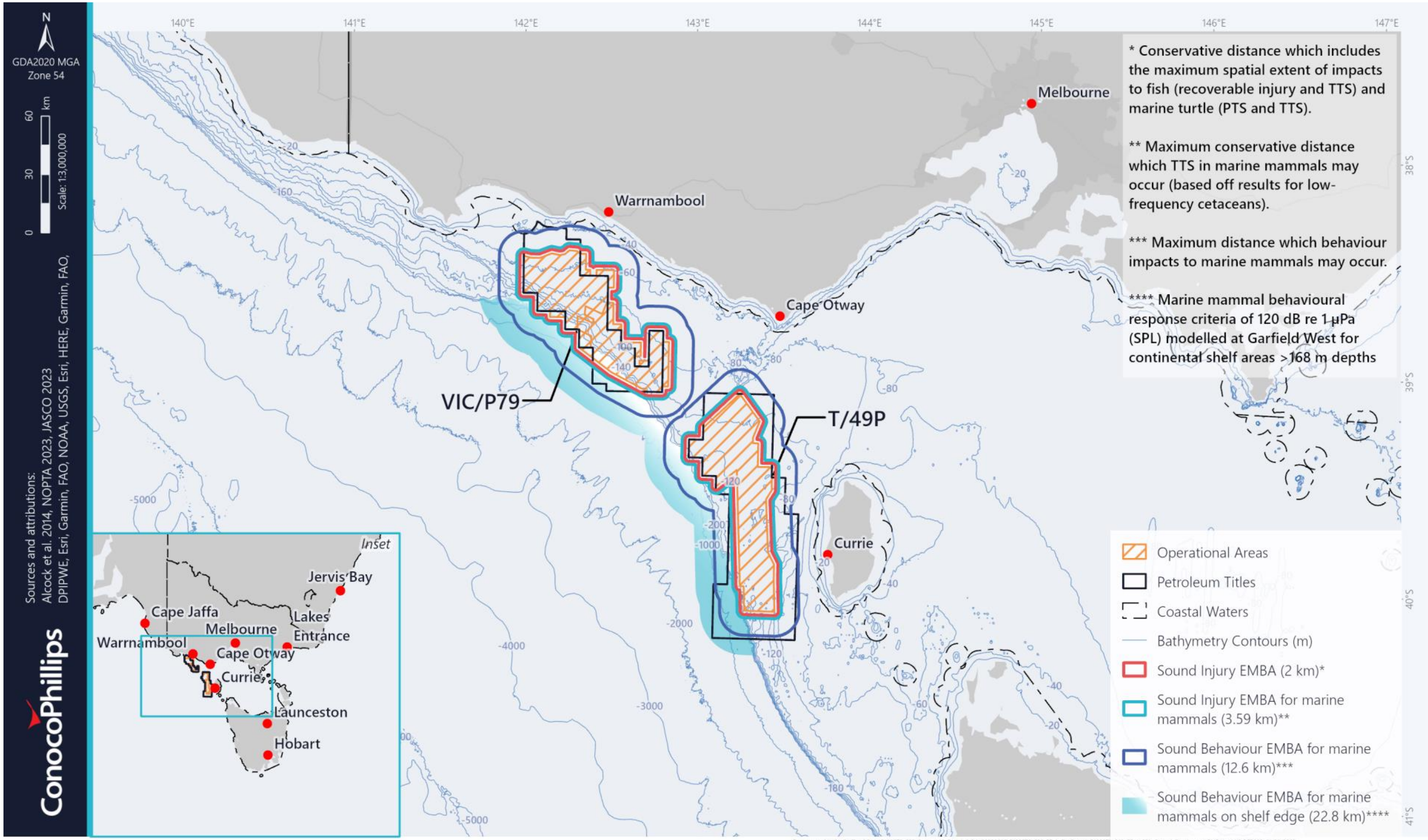


Figure 4-2: Otway Exploration Drilling Program Sound EMBAs (Continuous)

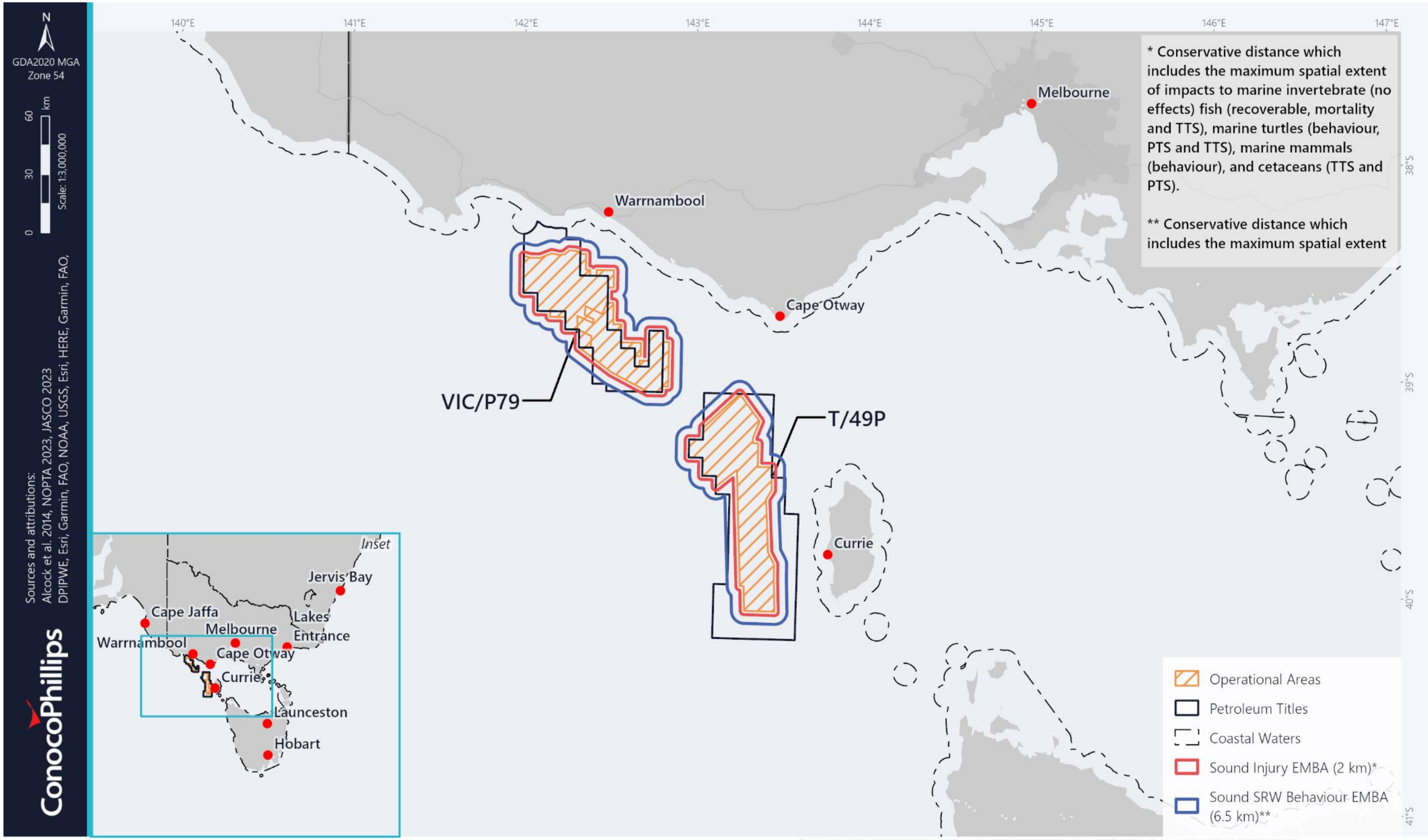


Figure 4-3: Otway Exploration Drilling Program Sound EMBAs (Impulsive)

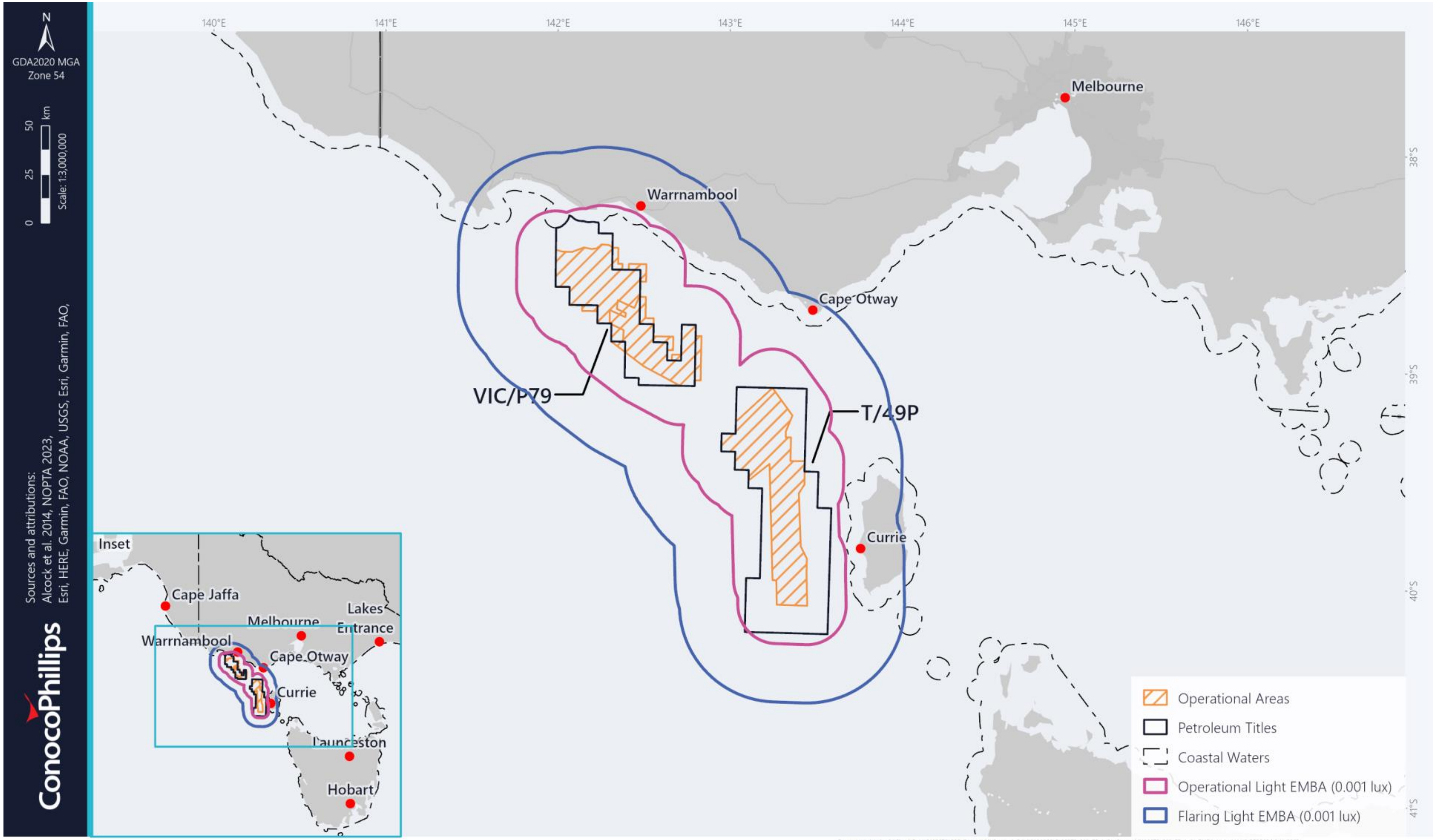


Figure 4-4: Otway Exploration Drilling Program Light EMBAs

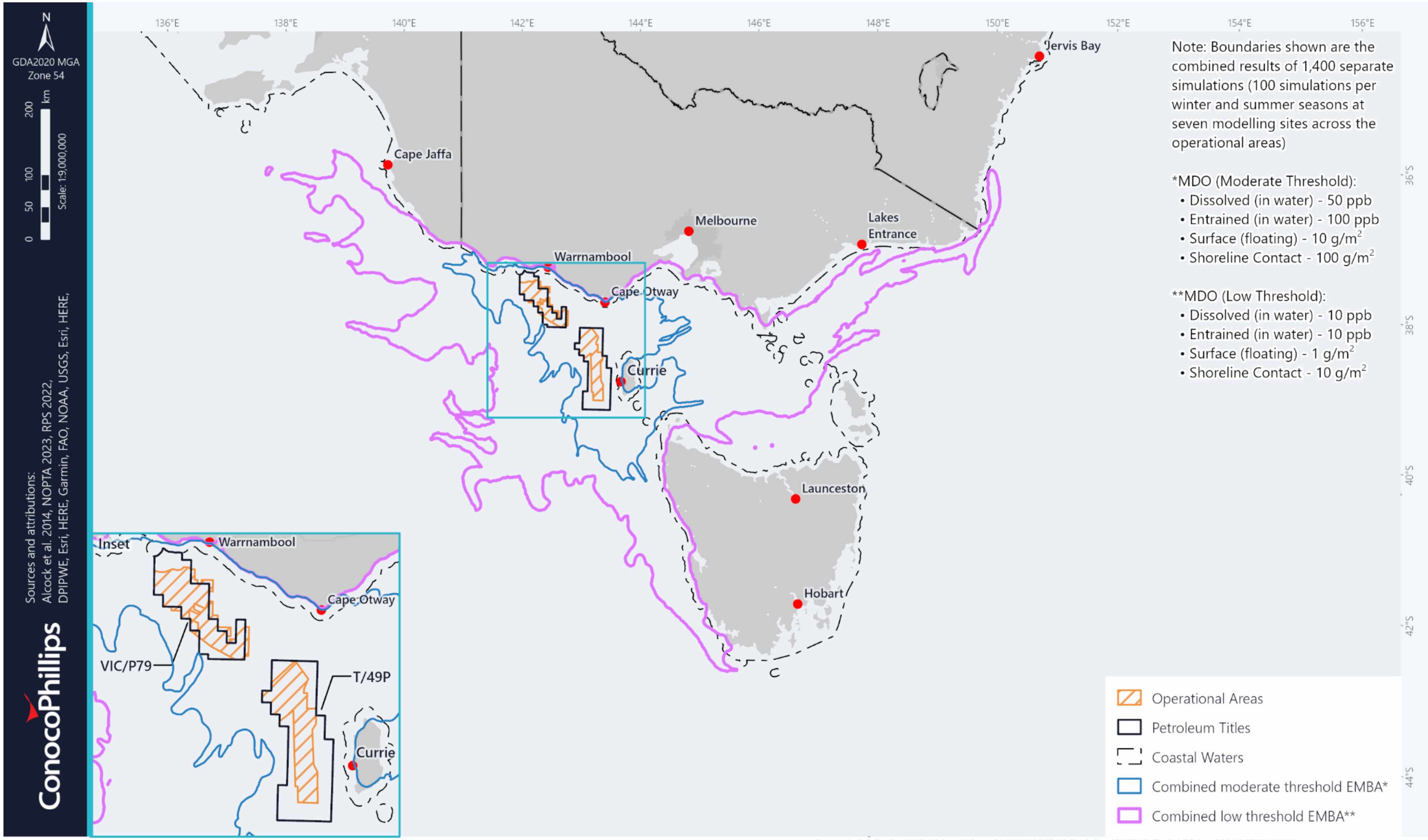


Figure 4-5: Otway Exploration Drilling Program MDO EMBAs

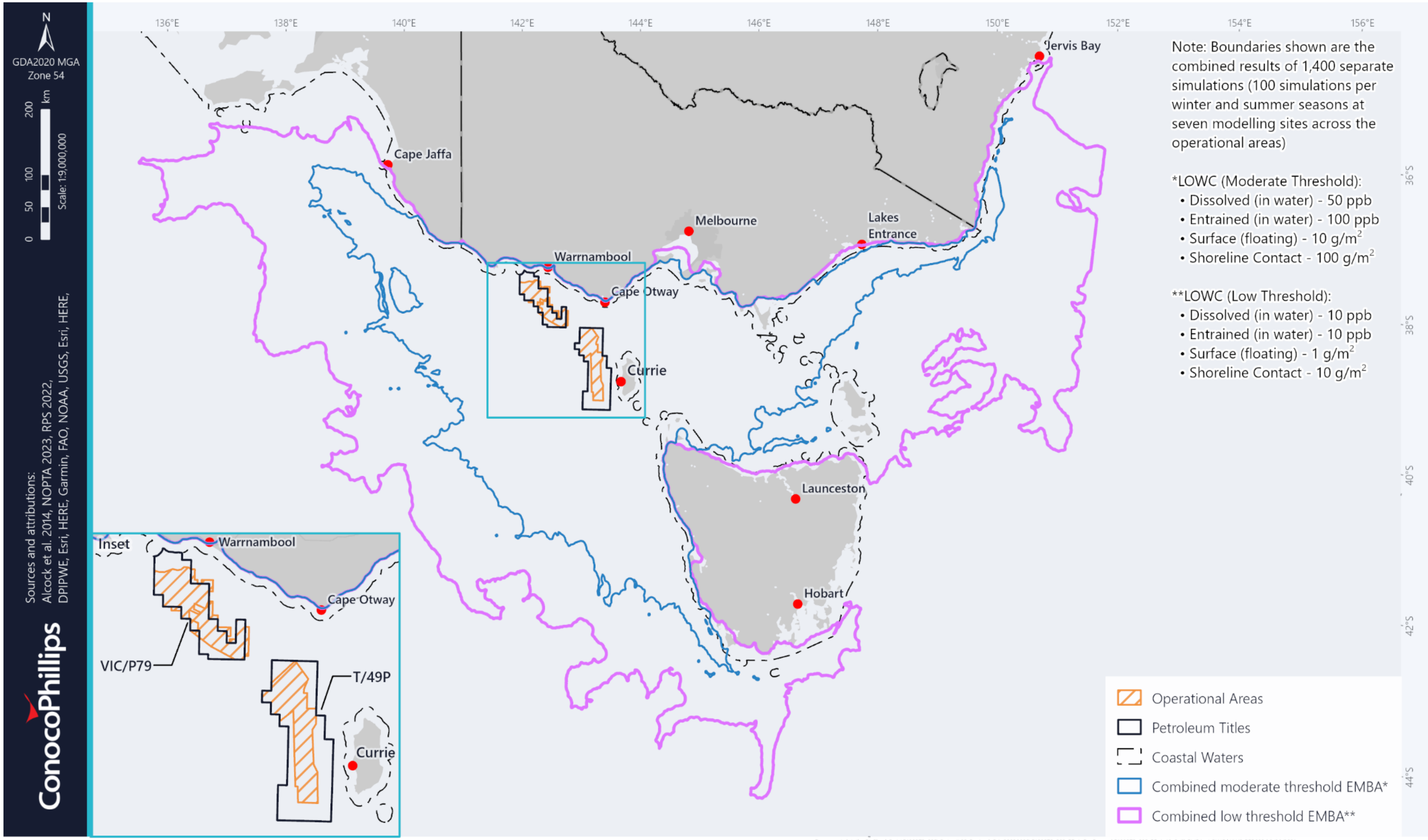


Figure 4-6: Otway Exploration Drilling Program LOWC EMBAs

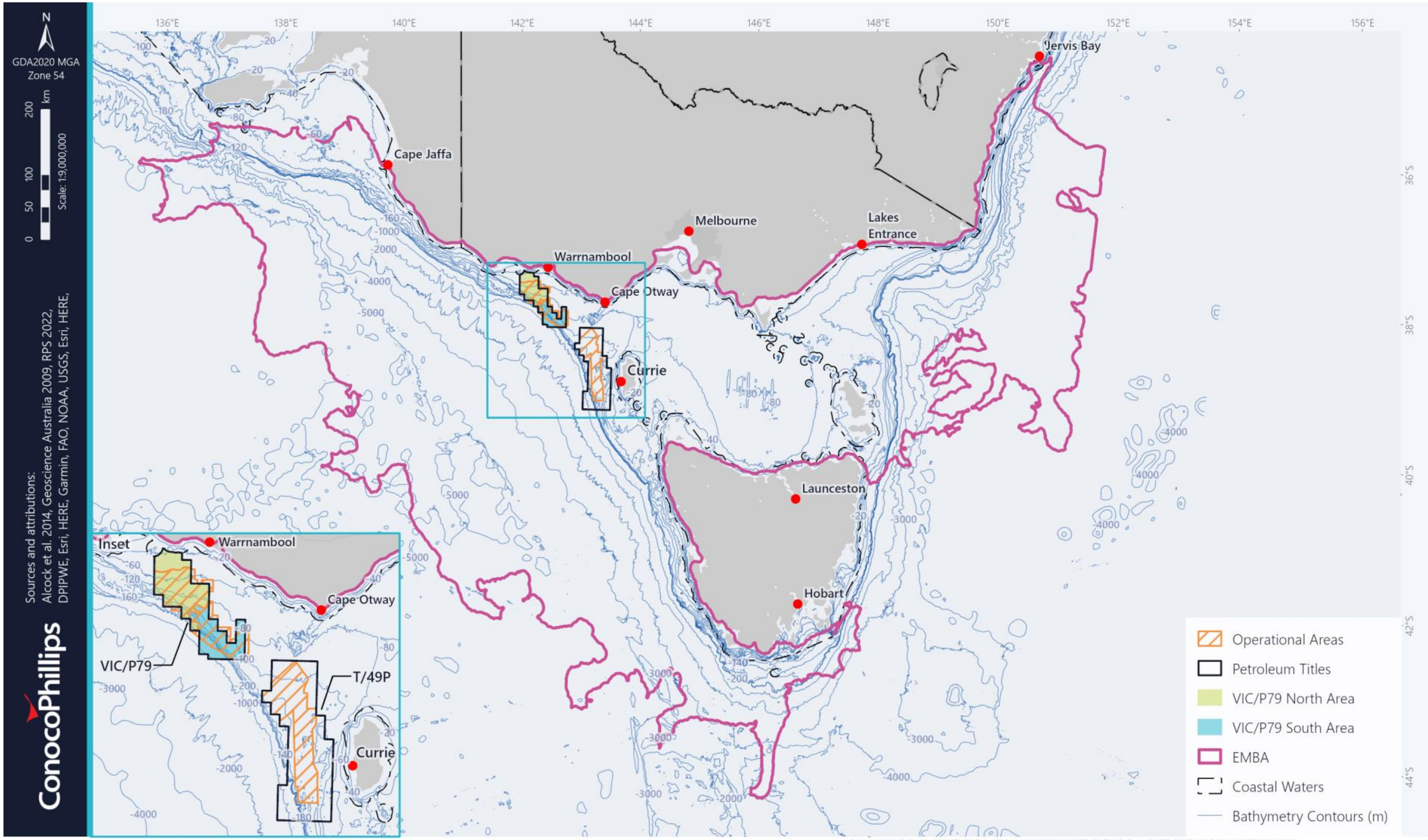


Figure 4-7: Otway Exploration Drilling Program EMBA

4.2. Regulatory Context

The Environment Regulations define the 'environment' as:

- Ecosystems and their constituent parts, including people and communities, and
- Natural and physical resources, and
- The qualities and characteristics of locations, places and areas, and
- The heritage value of places

and includes

- The social, economic and cultural features of all of the above matters.

In accordance with the Environment Regulations, this EP describes the physical, ecological, social, economic and cultural components of the environment.

Section 21(2) of the Environment Regulations requires that the EP describe the existing environment that may be affected by the activity and include details of the particular relevant values and sensitivities (if any) of that environment. Identified values and sensitivities must include, but are not necessarily limited to, the matters protected under Part 3 of the EPBC Act.

A greater level of detail is provided in the EP for those particular values and sensitivities as defined by the section 21(3) of the Environment Regulations, including, where relevant:

- The world heritage values of a declared World Heritage property within the meaning of the EPBC Act
- The national heritage values of a National Heritage place within the meaning of that Act
- The ecological character of a declared Ramsar wetland within the meaning of that Act
- The presence of a listed Threatened species or listed Threatened Ecological Community within the meaning of that Act
- The presence of a listed Migratory species within the meaning of that Act
- Any values and sensitivities that exist in, or in relation to, part or all of:
    - Commonwealth marine area within the meaning of that Act
    - Commonwealth land within the meaning of that Act.

4.3. Regional Environmental Setting

The Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) is a spatial framework for classifying Australia's marine environment into bioregions that make sense ecologically and are at a scale useful for regional planning (CoA 2006). Under this framework, the Otway Exploration Drilling Program occurs in Commonwealth waters within the Otway meso-scale region, which extends from Apollo Bay (Vic) to Cape Jaffa (South Australia) and includes the western islands of Bass Strait such as King Island (an area of 37,331 km^2).

The characteristics of the Otway marine bioregion environment include very steep-moderate offshore gradients, high wave energy and cold temperate waters subject to upwelling events (i.e. the Bonney Upwelling) (IMCRA 1998). Currents are generally slow, but moderately strong through the entrance to Bass Strait. Upwelling water is nutrient rich and corresponds with increases in the abundance of zooplankton which attracts baleen whales and other species (including EPBC-listed species) which feed on the plankton swarms (krill). Shoreline habitats of the Otway coastline include penguin colonies, fur seal colonies and bird nesting sites.

The operational areas and EMBA overlap areas covered by the Commonwealth of Australia's South-East Marine Bioregional Plan, Temperate East Marine Bioregional Plan and South-West Marine Bioregional Plan. These plans were developed to improve the way decisions are made under the EPBC Act in relation to the protection of marine biodiversity and the sustainable use of oceans and their resources by marine-based industries.

The South-east Marine Region, an area of 1,632,402 km^2, contains 11 bioregions under IMCRA and includes a broad range of temperate and subantarctic environments. The South-east Marine region extends from the far south coast of New South Wales (NSW), around Tasmania and as far west as Kangaroo Island in South Australia (SA). It includes the Commonwealth waters of Bass Strait and those surrounding Macquarie Island in the Southern Ocean. Significant variation in sea-floor features and water depth found throughout the South-east Marine Region contribute to the high level of species diversity. The shelf break (which includes the edges of the continental shelf and the upper slope) serves to intensify currents, eddies and upwellings, creating a rich and productive area for biodiversity (DoE 2015b).

The Temperate East Marine Region, an area of 1,470,000 km^2, contains seven bioregions under IMCRA. The boundary encompasses Commonwealth waters from the southern boundary of the Great Barrier Reef Marine Park to Bermagui in southern NSW including Lord Howe and Norfolk Island. The marine region is characterised by a narrow continental shelf, significant variation in sea-floor features (including seamount chains and canyons), dynamic oceanography, and a unique mix of tropical and cold-water reef systems. Temperate species dominate the southern parts of the region, and tropical species become progressively more common towards the north (DNP 2018).

The South-West Marine Region, an area of 1,300,000 km^2, contains seven bioregions under IMCRA and includes temperate and subtropical waters. The South-West Marine region includes the Commonwealth waters from the east of Kangaroo Island, SA to Shark Bay, Western Australia (WA). The region is characterised by a steep muddy continental slope that includes many canyons and complex oceanographic patterns which are primarily driven by the Leeuwin Current and have a significant influence on ecosystem structure and function. Globally, this environment has high levels of biodiversity and endemism particularly in the soft sediment ecosystems of the Great Australian Bight and the tropical and temperate species overlap on the west coast (DSEWPaC 2012g).

The EMBA overlaps nine IMCRA bioregions (Figure 4-8) across the three Marine Regions, including:

- Southeast Shelf Transition (overlaps both South-east and Temperate East Marine Regions)
- Southeast Transition (overlaps both South-east and Temperate East Marine Regions)
- Western Bass Strait Shelf Transition (South-east Marine Region)
- West Tasmania Transition (South-east Marine Region)
- Bass Strait Shelf Province (South-east Marine Region)
- Tasmanian Shelf Province (South-east Marine Region)
- Tasmania Province (South-east Marine Region)
- Spencer Gulf Shelf Province (South-east Marine Region)
- Southern Province (overlaps both South-east and South-west Marine Regions).

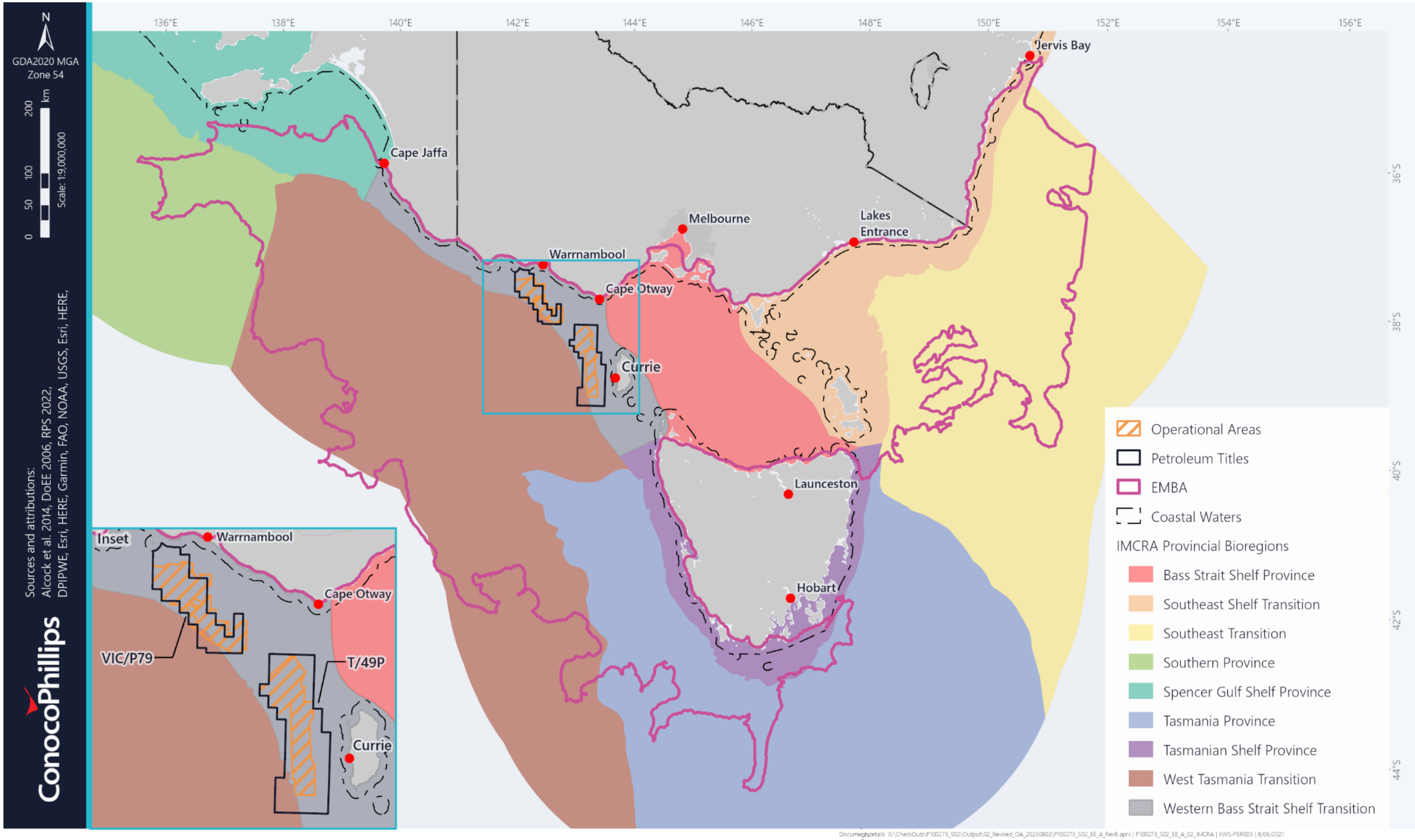


Figure 4-8: IMCRA Bioregions intersected by the EMBA

4.4. Conservation Values and Sensitivities

The VIC/P79 and T/49P operational areas directly overlap one area of conservation value or sensitivity, being the Zeehan Australian Marine Park. The following sections provide more detail on the conservation values overlapped by the operational areas and additional conservation values and sensitivities identified within the EMBA.

4.4.1. Australian Marine Parks

Australian Marine Parks (AMPs) occur within Commonwealth waters and were proclaimed as Commonwealth reserves under the EPBC Act in 2007 and 2013. ConocoPhillips Australia has undertaken to consider the AMPs and their representativeness (Org ID 7, Director of National Parks (DNP), Event ID: 2470, FB ID: 246) to ensure that the EP:

- Identifies all AMPs within the broader environmental planning area and their conservation values and sensitivities, as detailed in the following sections
- Identifies and manages all impacts and risks on AMP values (including ecosystem values) to an acceptable level and has considered all options to avoid or reduce them to as low as reasonably practicable, as detailed through-out Chapter 6. Environmental Impact Assessment (namely sections 6.3 Seabed Disturbance, 6.4 Light Emissions, 6.5 Atmospheric Emissions, 6.6 Underwater Sound Emissions - Non-impulsive, 6.7 Underwater Sound - Impulsive, 6.8 Planned Drilling Discharges and 6.9 Planned Operational Discharges) and in Chapter 7 (namely sections 7.3 Minor Loss of Containment, 7.4 Interaction with Marine Fauna, 7.5 Introduction, Establishment and Spread of Invasive Marine Species, 7.6 Marine Diesel Oil Release, 7.7 Loss of Well Control and 7.8 Spill Responses Activities), and
- Clearly demonstrates that the activity will not be inconsistent with the management plan, as detailed in the abovementioned impact and risk sections.

The South-east Commonwealth Marine Reserves Network and Temperate East Marine Reserve Network were designed to include examples of each of the provincial bioregions and the different seafloor features in the region (DNP 2013; DNP 2018). Provincial bioregions are large areas of the ocean where fish species and oceanic conditions are broadly similar. Activities within AMPs are dictated by zone classifications which describe activities that are allowed or may be authorised provided they are consistent with the IUCN management principles and will not have an unacceptable impact on the values of the area (DNP 2013). There are five different management zones which are in place to ensure the protection of marine habitats and species, including multiple use zone (IUCN VI) like that found in the Zeehan Marine Park.

The sea-floor features of the in the South-east Marine Region are diverse and include seamounts, canyons, escarpments, soft sediments and rocky reefs, which support high levels of biodiversity and species endemism (DNP 2013). There are a total of fourteen Commonwealth Marine Reserves (AMPs) within the South-east Marine Reserves Network, 11 of which are overlapped by the EMBA (Apollo, Beagle, Boags, East Gippsland, Flinders, Franklin, Huon, Murray, Nelson, Tasman Fracture and Zeehan Marine Parks).

The seafloor features of the Temperate East Marine Region are diverse and include abyssal plain/deep ocean floor, basins, canyons, plateaus, ridges, seamounts, and trench/troughs, which support high levels of biodiversity and species endemism (DNP 2018). There are a total of 8 Commonwealth Marine Reserves within the Temperate East Marine Network, one of which is overlapped by the EMBA (Jervis AMP).

The seafloor features of the South-west Marine Region are diverse and include mountain chains, submarine canyons, underwater plateaus and deep abyssal plains, which support high levels of biodiversity and species endemism (DNP 2018b). There are a total of 14 Commonwealth Marine Reserves within the South-west Marine Network, none of which are overlapped by the EMBA.

The South-east Commonwealth Marine Reserves Network Management Plan and the Temperate East Marine Parks Network Management Plan both identify pressures on the marine networks. Pressures are defined as human-driven processes, events and activities that may detrimentally affect the values of the reserves network (DNP 2013; DNP 2018). Sources of pressure on the conservation values of the Marine Networks relevant to the Otway Exploration Drilling Program may include:

- Extraction of living resources and by-catch associated with commercial and recreational fishing
- Marine pollution including the emissions of noise and light associated with offshore activities as well as marine debris and discharge of oil, chemicals and waste
- Establishment of invasive species, and
- Climate change including potential shifts in major currents, rising sea levels, ocean acidification, and changes in the variability and extremes of climatic features.

4.4.1.1. Zeehan AMP

The Zeehan AMP has two classification statuses. One portion of the AMP is considered a Special Purpose Zone and the other is a multiple use zone (IUCN VI). The Multiple Use Zone overlaps the T/49P operational area and is 165 km north-west of Tasmania. The Zeehan Marine Park multiple use zone (IUCN VI) provides for a wide range of sustainable activities by allowing those that do not significantly impact benthic (seafloor) habitats or result in an unacceptable impact on the values of the area. A recent hydrographic survey commissioned by the University of Tasmania in collaboration with Parks Australia and IMAS surveyed 701.5 km^2 (75%) of the Zeehan multiple use zone and found that the majority of the zone lies at a depth between 95 and 110 m (Davey et al. 2022). The topography of the marine park is described as mostly flat before sloping away to the west at the start of the shelf. Subtle changes were noted from east to west as ledges with 3-5 m of relief appear on the seabed approximately 28 km from the eastern edge. Further, there are 2 notable areas of high relief at the western edge of the survey area which were identified as sections of deep reef that extend 10 m from the seafloor (Davey et al. 2022).

Authorisation is required for activities within the Multiple Use Zone such as commercial fishing, mining, structure and works, among others and, consequently, ConocoPhillips Australia has undertaken consultation with the Director of National Parks as the authority responsible for the management of the Zeehan Marine Park in accordance with their consultation guideline (Organisation ID: 7). During consultation, it was identified that relevant persons were unaware of the types of activities that could be permitted within a multiple use zone of an Australian Marine Park (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 348, 434).

Water depth with the entire AMP ranges from 50 m to 3,000 over an area spanning 19,897 km^2 (Figure 4-9). A significant feature of this reserve is a series of four submarine canyons that incise the continental slope, extending from the shelf edge to the abyssal plain. When the Zeehan Current (extending from the west) meets these canyons, water swirls upwards, taking nutrients towards the surface and contributing to diverse marine life. The AMP includes a variety of seabed habitats, including exposed limestone, that supports animal communities of large sponges and other, permanently fixed, invertebrates on the continental shelf (DNP 2013). There are also extensive 'thickets' of invertebrate animals, such as lace coral and sponges, on the continental slope. The rocky limestone provides important habitat for a variety of commercial fish species, including the giant crab and southern rock lobster.

This AMP is an important foraging area for a variety of seabirds including the black-browed, wandering and shy albatrosses, and great-winged and cape petrels, and the white shark. It is also an important migration area for both the blue whale and humpback whale.

There are no known heritage sites of significance currently described in the AMP.

4.4.1.2. Apollo AMP

The Apollo AMP is a Multiple Use Zone (IUCN VI) east of the operational areas and represents the continental shelf that extends from SA to the west of Tasmania (Figure 4-9). The cool water is less than 50 m deep and includes the Otway Depression, a 100 m deep undersea valley joining the Bass Basin to the open ocean (DNP 2013). The waters of the reserve are exposed to large swell waves generated from the south-west and strong tidal flows. The sea floor has many rocky reef patches interspersed with areas of sediment and, in places, has rich, benthic fauna dominated by sponges.

Seabirds such as the black-browed and shy albatross, the Australasian gannet, the short-tailed shearwater and crested tern, along with dolphins, seals and the white shark forage in the reserve. While the pygmy blue whale (PBW), fin, sei and humpback whale all migrates through the Bass Strait (DNP 2013).

The AMP contains the wreck of the MV City of Rayville, a known heritage site of cultural significance.

4.4.1.3. Beagle AMP

The Beagle AMP is a Multiple Use Zone (IUCN VI) located entirely in the Bass Strait (Figure 4-9). The reserve lies east of the Otway Exploration Drilling Program in shallow water (50–70 m deep) and covers an area of 2,928 km^2 that surrounds the Hogan and Kent Group of islands. The reserve encompasses the fauna of central Bass Strait, which is expected to be especially rich based on studies of several sea floor–dwelling animal groups (DNP 2013). The deep rocky reefs support a rich array of sea life, including sponge gardens and Port Jackson sharks.

The reserve is located near the Furneaux group of islands which contains islands that provide homes and breeding grounds for seabirds, little penguins and Australian fur seals (DNP 2013). The sea surrounding breeding grounds provide important foraging areas for seabirds and shorebirds such as the fairy prion, shy albatross, silver gull, short-tailed shearwater, black-faced cormorant, Australasian gannet, common diving petrel and little penguin. The AMP is also an important area for the southern right whale (SRW).

The AMP contains the wrecks of the SS Cambridge steamship and the ketch Eliza Davies, known heritage sites of cultural significance.

4.4.1.4. Boags AMP

The Boags AMP is a Multiple Use Zone (IUCN VI) east of the Otway Exploration Drilling Program and 45 km off the north-west coast of Tasmania covering 537 km^2 (Figure 4-9). This AMP represents an area of shallow ecosystems that has a depth range between 40 m and 80 m. It encompasses the fauna of Bass Strait, which is expected to be especially rich based on studies of several seafloor-dwelling animal groups (DNP 2013). It contains a rich array of life, particularly benthic animals and animals living in the seafloor sediments and muds including crustaceans, polychaete worms and molluscs, which is common for the Bass Strait seabed. The sandy seabed of the AMP is also likely to host benthic fish such as flathead, skates, rays and latchets but not extensive sponge gardens.

The reserve is adjacent to important seabird colonies of Tasmania’s north-west, particularly the Hunter Island Group including Three Hummock Island, Hunter Island, Steep Island, Bird Island, Stack Island and Penguin Islet. Bird species present in the Hunter group include shy albatross, fairy prions, black-faced cormorants, common diving petrels, little penguins and cape barren geese. It is likely that the rich abundance of benthic fauna facilitates the presence of pelagic fish species within the AMP. The proximity of these two features means that the AMP is an important foraging area for the variety of seabirds that inhabit the Hunter group (DNP 2013). The AMP overlaps the identified BIAs of several seabird species including the black-browed albatross, Buller’s albatross, Campbell albatross, Indian yellow-nosed albatross, shy albatross, wandering albatross, white-faced storm petrel, common diving petrel and short-tailed shearwater as well as the SRW and PBW Biologically Important Areas (BIAs). The marine park is also on the migration route for the Critically Endangered orange-bellied parrot as they travel across Bass Strait each spring and autumn on their migration to and from Tasmania to the Australian mainland (Australian Marine Parks 2022).

There are no known heritage sites of cultural significance currently described in the AMP.

4.4.1.5. East Gippsland AMP

The East Gippsland AMP is a Multiple Use Zone (IUCN VI) north-east of the Otway Exploration Drilling Program and 42 km off the north-east corner of Victoria (Figure 4-9). Water depth ranges between 600 m to 4,000 m over a total area of 4,137 km^2. The reserve represents extensive canyon networks, continental slope and escarpment with geological features such as rocky-substrate habitat, submarine canyons, escarpments and a knoll, which juts out from the base of the continental slope (DNP 2013). The reserve includes both warm and temperate waters, which create habitat for free-floating aquatic plants or microscopic plants (i.e. phytoplankton) communities and complex seasonality in oceanographic patterns influences the biodiversity and local productivity (DNP 2013).

Many oceanic seabirds forage in these waters, including albatrosses (e.g. wandering, black-browed, Indian yellow-nosed and shy albatrosses), the great-winged petrel, wedge tailed shearwater and cape petrel. Humpback whales pass by during their migrations north and south along the eastern seaboard (DNP 2013).

There are no known heritage sites of cultural significance currently described in the AMP.

4.4.1.6. Flinders AMP

The Flinders AMP is a Multiple Use Zone (IUCN VI) and Marine National Park Zone (IUCN II) south-east of the Otway Exploration Drilling Program and 26 km off the north-east coast of Tasmania (Figure 4-9). Water depths range from 40 m to 3,000 m over a total area of 27,043 km^2. Key geological features include the continental shelf, and a long section of steep continental slope, incised by a series of deep submarine canyons (DNP 2013). A rich diversity of small seabed animals, fish and giant crabs are supported by large rocky outcrops, sheer rocky walls and large expanses of sandy and muddy sediment habitat. The biodiversity of the reserve is influenced by summer incursions of the warm East Australian Current and associated large-scale eddies (DNP 2013).

Another prominent feature is a large offshore seamount. The large seamounts to the east of Tasmania are believed to be individually important, providing habitat to species that may be unique to each seamount and to a range of more widely occurring species that make their homes only on their rocky slopes (DNP 2013). Presently, little is known about the fauna of these seamounts, but based on information from other better known offshore seamounts, seabed animals are expected to include endemic species.

There are no known heritage sites of cultural significance currently described in the AMP.

4.4.1.7. Franklin AMP

The Franklin AMP is a Multiple Use Zone (IUCN VI) south-east of the Otway Exploration Drilling Program and 31 km off the north-west coast of Tasmania (Figure 4-9). Water depths range from 40 m to 150 m over a total area of 671 km^2. The reserve represents an area of shallow continental shelf ecosystems and incorporates the major bioregions of western Bass Strait and the Tasmanian shelf (DNP 2013). A recent hydrographic survey commissioned by the University of Tasmania in collaboration with Parks Australia and IMAS surveyed 271.2 km^2 (40%) of the Franklin AMP. Results showed that reef/rock systems dominate in the north-eastern end of the park and that there is evidence of similar forms on the eastern edge of the park (Davey et al. 2022). Further, the southern end of the park has a deeper trough or channel which runs north/south.

The ocean reserve provides feeding grounds for seabirds including shy albatross, short-tailed shearwater, Australasian gannet, fairy prion, little penguin, common diving petrel, black-faced cormorant and silver gull that have breeding colonies on the nearby Hunter Island Group. The white shark is also known to forage in the park (DNP 2013).

There are no known heritage sites of cultural significance currently described in the AMP.

4.4.1.8. Huon AMP

The Huon AMP is a Multiple Use Zone (IUCN VI) and Habitat Protection Zone (IUCN IV) south-east of the Otway Exploration Drilling Program and 19 km south-east of Tasmania (Figure 4-9). Water depths range from 70 m to 3,000 m over a total area of 9,991 km^2. The majority of the reserve is deep water and contains a cluster of seamounts which provide a range of depths for a diversity of plants and animals some of which are hundreds and possibly thousands of years old (DNP 2013).

Seamounts are regarded as areas of increased productivity in the otherwise nutrient-poor open ocean and are generally considered to be important steppingstones in the transoceanic dispersal of larvae of bottom-dwelling species. Their topography accelerates water currents which sweep the seamounts, exposing rocks for animals, such as corals, to attach as well as providing a consistent and relatively rich food source for filter feeders (DNP 2013). Benthic communities at depths less than 1,400 m are coral dominated while communities deeper than 1,400 m are urchin dominated.

The reserve is a foraging area for seabirds including the black-browed, Buller's and shy albatrosses, great-winged petrel, short-tailed shearwater and fairy prion as well as the white shark and Australian fur seal. The reserve is also considered a spawning or nursery area for important commercial fish, including ocean perch and blue warehou.

There are no known heritage sites of cultural significance currently described in the AMP.

4.4.1.9. Jervis AMP

The Jervis AMP is a Special Purpose Zone (Trawl) (IUCN VI) and Habitat Protection Zone (IV) north-east of the Otway Exploration Drilling Program and approximately 20 km east of NSW (Figure 4-9). Water depth ranges from 120 m to 5,000 m over a total area of 2,473 km^2. Significant ecological features include canyons on the eastern continental slope and shelf rocky reefs which are both valued as unique seafloor features with regional significance (DNP 2018). Canyons interact with ocean currents and gyres resulting in plankton blooms associated with upwellings and result in enhanced diversity and abundance of species within the area (DNP 2018).

A variety of species utilise the reserve and it is a known BIA for foraging seabirds, grey nurse sharks and humpback whales (DNP 2018).

4.4.1.10. Murray AMP

The Murray AMP includes a Multiple Use Zone (IUCN IV), Special Purpose Zone (IUCN VI) and Marine National Park Zone (II) all of which are intersected by the EMBA. The AMP is located off the SA coast north-west of the operational areas (Figure 4-9). Water depths range from 24 m to 4,600 m spanning an area of 25,803 km^2. Significant features include the shelf rocky reefs and hard substrate and seasonal upwellings which are both recognised as features that increase biodiversity and productivity within the AMP (DNP 2013).

The marine park contains the Murray Canyon, reaching depths of 4,600 m and stretching over 150 km (DNP 2013). It is considered one of the most spectacular geological formations on the Australian continental margin. Waters of the reserve provide important habitat for many marine species. The nutrient-rich waters provide foraging habitat for a variety of species including the blue whale, sei and fin whales, Australian sea lion, white sharks and many marine seabird species. The AMP is frequented by the SRW which utilises the inshore waters for breeding and nursing of their young (DNP 2013).

One of the first management plans for Sea Country has been developed by the people of the Ngarrindjeri Nation alongside the Australian Government and includes areas in and around the Murray AMP.

4.4.1.11. Nelson AMP

The Nelson AMP is a Special Purpose Zone (IUCN VI) north-west of the Otway Exploration Drilling Program and 88 km south-west of the South Australian and Victorian border (Figure 4-9). Water depth is approximately 3,000m over a total area of 6,123 km^2. The reserve contains geological features including plateaus, knolls, canyons and the abyssal plain—a large area of extremely flat or gently sloping ocean floor just offshore from a continent (DNP 2013). Little is known about the benthic diversity of this reserve; however, it is likely that migration of the blue, fin, sei, and humpback whale will occur here (DNP 2013).

There are no known heritage sites of cultural significance currently described in the AMP.

4.4.1.12. Tasman Fracture AMP

The Tasman Fracture AMP includes a Special Purpose Zone (IUCN VI), Marine National Park Zone (IUCN II) and a Multiple Use Zone (IUCN VI). It is south-east of the Otway Exploration Drilling Program and 18 km south-west of Tasmania and spans over a total area of 42,501 km^2 (Figure 4-9). The reserve spans the continental shelf, continental slope and encloses geological features, including steep canyons, escarpments and troughs, saddles, basins, and part of a plateau that is over 400 km long and rises 3 km above the sea floor (DNP 2013). Some undersea peaks rise to less than 1,500 m below the sea surface and provide habitat to deep water hard corals. These corals provide a structure and habitat for a rich diversity of marine invertebrate animals that live attached corals (DNP 2013).

Waters of the reserve are home to many species of seabirds, seals and cetaceans, such as dolphin, killer whale and the white shark. Due to its southerly location, extending south of the subtropical convergence zone and into the subantarctic front, the fauna of this reserve includes subantarctic fishes and seabed invertebrates on the continental shelf and slope (DNP 2013). Biodiversity in this reserve is influenced by the most easterly extent of flow of the Zeehan Current.

There are no known heritage sites of significance currently described in the AMP.

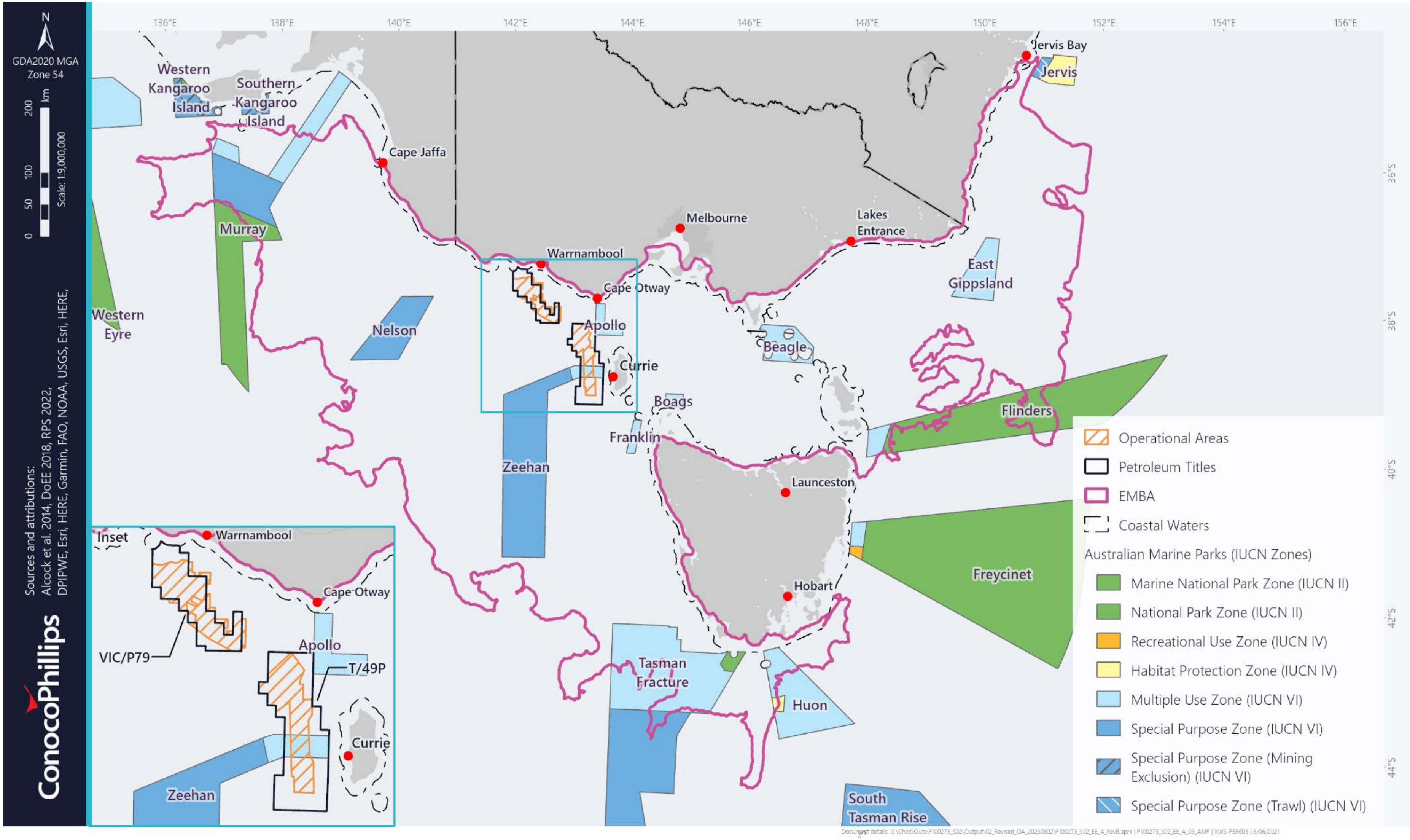


Figure 4-9: Australian Marine Parks within EMBA

4.4.2. World Heritage Properties – Tasmanian Wilderness

World Heritage-listed properties must be of outstanding universal value to humanity. In Australia, World Heritage properties are protected under Chapter 5, Part 15 of the EPBC Act. The Tasmanian Wilderness World Heritage Area (TWWHA) intersects the EMBA along its coastal extent of 755 km in the south-south-west of Tasmania, as shown in Figure 4-10.

The Tasmanian wilderness is one of the largest temperate wilderness areas and a precious cultural landscape for Tasmanian First Nations people who have lived there for at least 35,000 years.

The TWWHA encompasses more than 1,580,000 hectares covering almost a quarter of the island state of Tasmania, including 755 km of coastline and the offshore Maatsuyker Island Group (DCCEEW 2021a; Rudman et al. 2008). The region is renowned for its diversity of flora with some of the longest-lived trees and tallest flowering plants in the world and provides a stronghold for several animals that are either extinct or threatened on mainland Australia. This diversity of vegetation within the region has granted its classification of an International Centre for Plant Diversity by the International Union for Conservation of Nature (IUCN). The diverse topography, geology, soils and vegetation, in association with harsh and variable climatic conditions, combine to create a wide array of animal habitats with a high proportion of endemic species and relict groups of ancient lineages (DCCEEW 2021a).

The TWWHA is home to some of the deepest and longest caves in Australia and contains hundreds of archaeological sites with rocks from almost every geological period. These caves contain evidence of the hunting and gathering lifestyles of the people who occupied these high southern latitudes, some caves even contain dense, well-preserved layers of animal bones, tools and hearths and others contain early hand stencils (DCCEEW 2021a).

4.4.3. National Heritage Places

The National Heritage List is Australia's list of natural, historic and Indigenous places of outstanding significance to the nation. These places are protected under Chapter 5, Part 15 of the EPBC Act. There are 6 National Heritage Listed Areas that overlap the EMBA:

- Great Ocean Road
- Recherche Bay (North East Peninsula) Area
- Western Tasmania Aboriginal Cultural Landscape
- Point Nepean Defence Sites and Quarantine Station Area
- Quarantine Station and Surrounds, and
- Tasmanian Wilderness (described in Section 4.4.2).

Of the National Heritage Places listed above, 4 have coastal features while the others are located above the high-water mark. Those with coastal features are detailed below and displayed in Figure 4-10.

4.4.3.1. Great Ocean Road

The Great Ocean Road was designed as a utilitarian memorial to all Australian First World War servicemen and as a gift to residents and tourists to enable access to the spectacular coastal vistas and landscapes through construction of the serpentine route (DCCEEW 2022).

The road runs through an area that is 150 million years old and includes rare polar dinosaur fossils, collected from sites along the coast which continue to yield important scientific information. Further, the Port Campbell Limestone coast is the definitive place in Australia to observe and study limestone geomorphology and coastal erosion processes on rocky coasts (DCCEEW 2022). Rock formations found along the limestone coast which the Great Ocean Road follows include the Twelve Apostles, a collection of limestone stacks 45 m high that, due to erosion by waves, have been reduced down to eight. Other examples of the dynamic nature of this coast include London Arch, formerly known as the London Bridge until part of the structure collapsed unexpectedly in January 1990, and Island Arch, which collapsed in June 2009 (DCCEEW 2022).

4.4.3.2. Recherche Bay (North Peninsula) Area

In 1792 an expedition led by Bruni d'Entrecasteaux accidentally landed in what was thought to be Adventure Bay and later named Recherche Bay. They were stopped initially for 4 weeks and then returned later for another 3 weeks. During this time Recherche Bay saw activity from 221 French explorers who set up camp, prepared a garden and scientific observatory, and catalogued species while supplies were replenished (DCCEEW 2022). The French garden was planted with the intention of providing food for other maritime adventures, in addition to being a gift to the First Nations people. Encounters on the north east peninsula of Recherche Bay between the French and the First Nations people provided an early opportunity for meetings and mutual observation. Recordings, from the French perspective, of these encounters, are important observations into the lives of the Tasmanian First Nations people and have contributed significantly to the knowledge of the diversity of traditional First Nations cultures (DCCEEW 2022).

The first scientific experiment in Australia was also conducted here and was the observation that geo-magnetism varied with latitude which would revolutionise compass use and make navigation much safer, especially in and around Terra Australis Incognita. This was of great significance to navigational science and the event was commemorated by the unveiling of a plaque on the site by the Commonwealth Scientific and industrial Research Organisation (CSIRO) in 1992 (DCCEEW 2022).

4.4.3.3. The Western Tasmania Aboriginal Cultural Landscape

During the late Holocene period, First Nations people on the west coast of Tasmania developed a specialised and more sedentary culture based on a dependence on seals, shellfish and land mammals. This way of life is represented by shell middens that lack the remains of bony fish but contain 'hut depressions' which sometimes formed semi-sedentary villages (DCCEEW 2022). Nearby some of these villages are circular pits in cobble beaches which the First Nations community believes are seal hunting hides. The remains of the shell middens in the Western Tasmania Aboriginal Cultural Landscape and its accompanying hut depressions provide evidence of an unusual, specialized and more sedentary First Nations community that began almost 2,000 years ago and continued until the 1830s. Archaeological studies of the area found evidence of early villages built near an elephant seal colony. Based on the large number of seal bones in the middens, it is believed the elephant seals where a major source of First Nations people's diet in the area (DCCEEW 2022). The Western Tasmania Aboriginal Cultural Landscape also contains other stone artefact scatters, stone arrangements, rock engravings and shelters and human burials that provide further insight into this unique way of life.

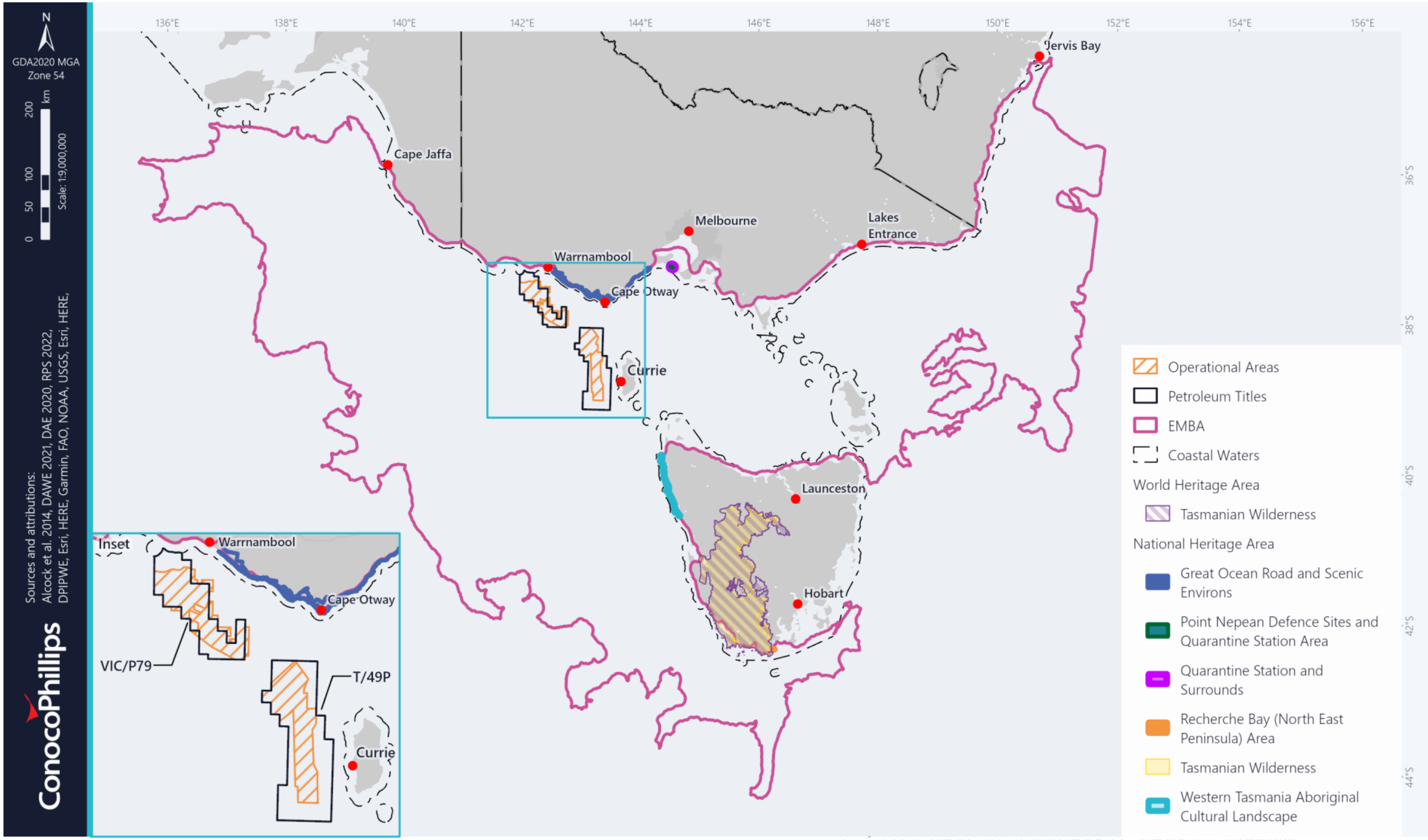


Figure 4-10: World and National Heritage Places within the EMBA

4.4.4. Commonwealth Heritage Places

Commonwealth Heritage-listed places are natural, Indigenous and historic heritage places owned or controlled by the Commonwealth. In Australia, these properties are protected under EPBC Act. There are 29 properties on the Commonwealth Heritage List that occur within the EMBA:

- Royal Australian Naval College (Australian Capital Territory (ACT))
- Cape St George Lighthouse Ruins & Curtilage (ACT)
- Jervis Bay Territory (ACT)
- Jervis Bay Botanic Gardens (ACT)
- Hive Survivor Camp (ACT)
- Christians Minde Settlement (ACT)
- Tasmanian Seamounts Area (External Territories (EXT))
- Montague Island Lighthouse (NSW)
- Point Perpendicular Lightstation (NSW)
- Beecroft Peninsula (NSW)
- Crocodile Head Area (NSW)
- Eddystone Lighthouse
- Goose Island Lighthouse (TAS)
- Tasman Island Lighthouse (TAS)
- Cape Wickham Lighthouse (TAS)
- Mersey Bluff Lighthouse (TAS)
- Cape Sorell Lighthouse (TAS)
- Table Cape Lighthouse (TAS)
- Swan Island Lighthouse (TAS)
- Swan Island Defence Precinct (VIC)
- Gabo Island Lighthouse (VIC)
- HMAS Cerberus Central Area Group (VIC)
- Swan Island and Naval Waters (VIC)
- Point Wilson Defence Natural Area (VIC)
- HMAS Cerberus Marine and Coastal Area (VIC)
- Sorrento Post Office (VIC)
- Fort Queenscliff (VIC)
- Wilsons Promontory Lighthouse (VIC)
- Cape Northumberland Lighthouse (SA)

Of the Commonwealth Heritage Places listed above, only 7 have seafloor and/or coastal features while the rest are above the high-water mark. Those with seafloor and/or coastal features are detailed below and displayed in Figure 4-11.

4.4.4.1. Jervis Bay Territory

The Jervis Bay Territory is 7,600 ha that is owned by the Commonwealth with the majority of the Territory still in its natural state. It harbours a high diversity of plants representing a northern or southern distribution limit for 33 species of plants along with supporting a high number of significant fauna species (DCCEEW 2021b). The bay supports substantial beds of seagrass which are significant in terms of species richness and provide nursey, spawning and feeding grounds for many fish species.

The area is home to the Koori people of Wreck Bay who established a settlement in the early 1900s. The area was chosen due to its proximity to both the sea and bush as well as its distance from non-indigenous settlements (DCCEEW 2021b). Strong cultural ties to the area continue to be maintained through the passing on of ancestral and creation stories relating to the area.

4.4.4.2. Tasmanian Seamounts Area

The Tasmanian seamounts area is located between 50 and 100 km off southern Tasmania and includes approximately 70 seamounts on the continental slope. Typically, seamounts are cone-shaped, roughly 200-500 m high and several km across at their base. Often, they are regarded as an oasis of productivity by providing habitat in the deep, dark, open ocean. These formations support benthic communities dominated by cold-water species and are characterised by high species richness and endemism (DCCEEW 2021b). Further, species richness is often associated with the influence that seamounts have on the movement of ocean currents. Slow currents found in the deep sea are enhanced by seamount topography and result in the deposit of minimal sediment allowing the evolution of unique deep-sea benthic communities often dominated by corals and other filter feeders to thrive (DCCEEW 2021b).

4.4.4.3. Beecroft Peninsula

The Beecroft Peninsula is located on the northern headland of Jervis Bay and is a Permian cliffed coastline. The area is rich in floristic diversity, supporting a variety of vegetation types, including eucalypt forest, saltmarsh, heathland, mangroves, freshwater swamps, and subtropical and littoral rainforest (DCCEEW 2021b). The diversity in the flora communities in turn supports various listed threatened bird species and 35 listed migratory bird species, providing biologically important habitat for activities like breeding, resting and foraging (DCCEEW 2021b).

The area is of high cultural significance to the Jerinja and Wreck Bay First Nations communities and is connected to many stories of ancestral beings. Evidence of past First Nations activity including middens, artefact scatters, paintings, rock shelters and grinding grooves ceremonial grounds can be found on the peninsula (DCCEEW 2021b).

4.4.4.4. Swan Island and Naval Waters

The Swan Island and naval water heritage place is classified as a natural listing. It is located off the Bellarine Peninsular in Victoria and separated from Queenscliffe by a narrow artificial channel. Swan Island has primarily been built by wave actions rather than aeolian forces which have played a major role in determining the pattern of sedimentation in Swan Bay (DCCEEW 2021b). Swan Island and the naval waters are considered to be an integral part of Swan Bay which is a high value wetland with regionally significant and extensive seagrass meadows, a diverse collection of fish species and an important breeding and nursery area for fish (DCCEEW 2021b). Further, Swan Island and the naval waters help support large populations of both shorebirds and seabirds who frequent Swan Bay. One particular species that is supported by this ecosystem is the Critically Endangered orange-bellied parrot (*Neophema chrysogaster*) which utilise Swan Bay as one of three major wintering sites and feed on the saltmarshes along the fringes of Swan Island (DCCEEW 2021b).

There are 10 historic shipwrecks in the vicinity of Swan Island and the location of 6 of these are known within Swan Island naval waters.

4.4.4.5. Point Wilson Defence Natural Area

Point Wilson Defence Natural Area is classified as a natural listing and covers approximately 176 ha of the central-western coast of Port Philip Bay. Point Wilson is considered an integral part of the Western Port Philip Bay Ramsar area, which is a wetland of international significance that supports many migratory, shore and seabirds. The natural area supports a diverse salt marsh community and provides essential foraging grounds for the survival of the orange-bellied parrot during winter months (DCCEEW 2021b).

This area is of high cultural significance for the Wathaurong people who have a strong cultural connection to the land and ecological values of the area, with many sites and artefacts recorded at Point Wilson Defence Natural Area (DCCEEW 2021b).

4.4.4.6. HMAS Cerberus Marine and Coastal Area

The Sandy Point/HMAS Cerberus area has high geomorphological, botanical and zoological significance that extends east from Somers on the western shore of Western Port in Victoria. Sandy Point is one of the largest spit systems on the Victorian coast and one of the state's most dynamic shorelines (DCCEEW 2021b). Faunal richness is related to the diversity of habitats which range from deep marine channels to intertidal mudflats, seagrass beds, mangroves and saltmarsh, all of which occur in the Cerberus/Sandy Point area. Several threatened bird species have been recorded in the area due to these habitats which provide secondary feeding grounds for significant populations of migratory and resident shorebirds common to Western Port (DCCEEW 2021b). Sandy Point further supports some of the best remaining examples of coastal banksia woodland, coastal grassy forest, and coastal dune scrub in the region.

4.4.4.7. Crocodile Head Area

The Crocodile Head Area is classified as an indigenous listing and is approximately 20 ha, located near Crocodile Head and Currarong on the Beecroft Peninsular. Limited information is publicly available about this area.

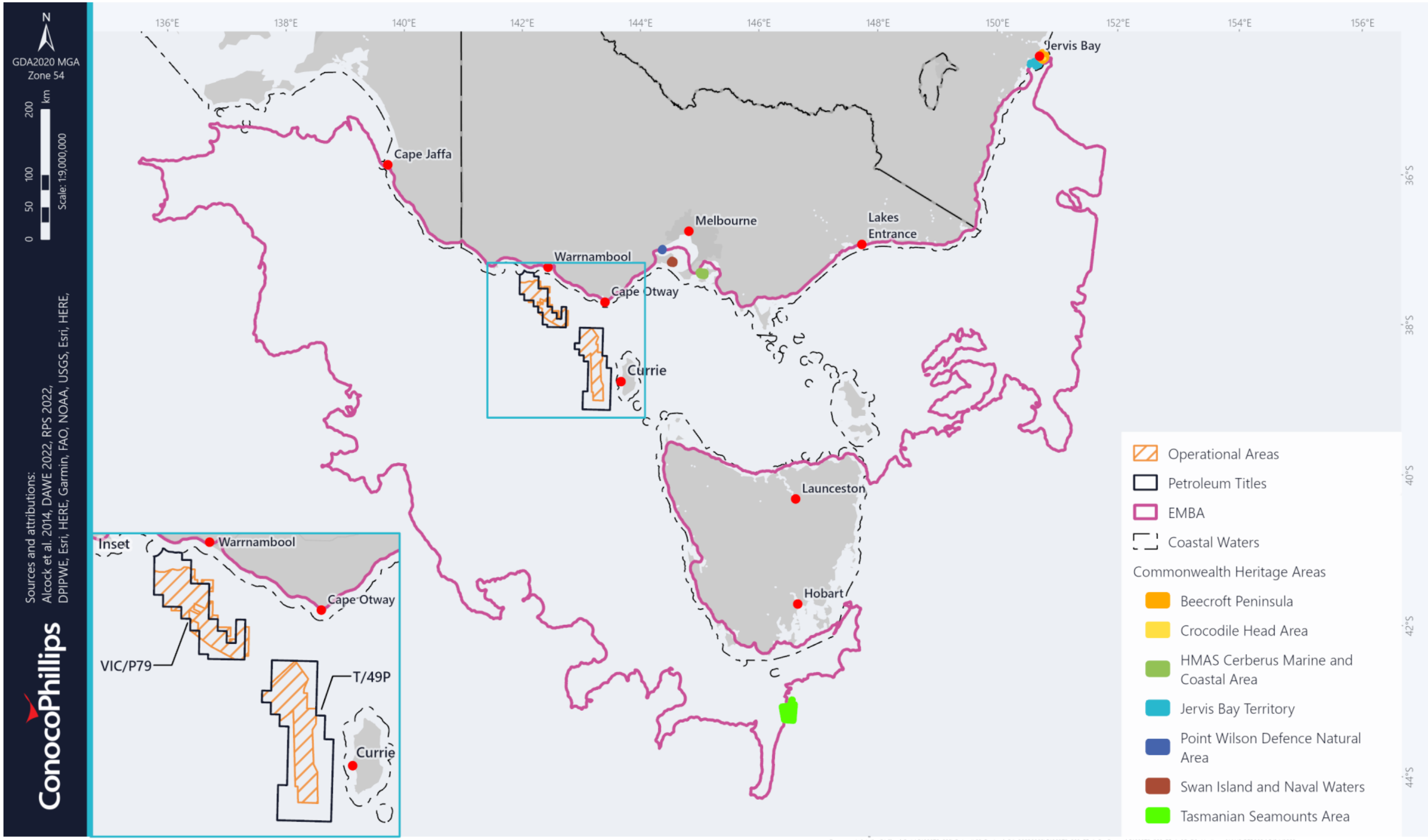


Figure 4-11: Commonwealth Heritage Places within EMBA

4.4.5. Wetlands of International Importance

Australia has 67 wetlands of international importance (‘Ramsar wetlands’) that cover more than 8.3 million hectares (as of November 2022) (DCCEEW 2022b). Ramsar wetlands are those that are representative, rare or unique wetlands, or are important for conserving biological diversity, and are included on the List of Wetlands of International Importance developed under the Ramsar Convention. These wetlands are protected under the EPBC Act. There are 9 Ramsar sites that intersect the EMBA which are detailed in the following sections and displayed in Figure 4-12.

Pressures to Ramsar wetlands tend to depend on the location of site and its proximity to anthropogenic activities. However, there are overarching pressures relevant to the activity that tend to impact all listed wetlands which are acknowledged below (DSEWPaC 2012f):

- Climate change – has the potential to change water regimes from increased temperatures and decreased rainfall as well as the salinisation of coastal systems due to sea level rise all of which are critical components to wetlands and interrupt the natural ebb and flow of the wetland system.
- Invasive species – creates competition with native species and degrades the environment of native animals and plants.
- Water pollution – including agricultural runoff, marine debris, and discharge of oil, chemicals and waste.

4.4.5.1. Corner Inlet

The Corner Inlet site is situated 200 km south-east of Melbourne and is the southern-most marine embayment and intertidal flat location on mainland Australia. The site and its catchment areas are a component of the broader West Gippsland Catchment Management Authority and the inlet is essentially one large area of marine embayment consisting of a submerged plain covered by sand or mud flats with well-developed seagrass beds and large sand islands (DSEWPaC 2011c). The major features of Corner Inlet are its large geographical area, wetland variety, diversity of aquatic and semi-aquatic habitats and abundant flora and fauna. Marine flora communities within the Ramsar site are especially noteworthy due to their unique status in the bioregion. In particular, the Ramsar site has the largest *Posidonia* seagrass beds in Victoria and elsewhere in the Southeast Coast IMCRA Transition bioregion and is home to the southernmost distribution of white mangroves in the world (DSEWPaC 2011c).

The variety of habitat associated with the Ramsar site has enabled the settlement of approximately 390 species of indigenous flora and approximately 160 species of indigenous terrestrial fauna and over 390 species of marine invertebrates (DSEWPaC 2011c). Several threatened, migratory and marine bird species protected under various international agreements including the great knot (*Calidris tenuirostris*), fairy tern (*Sternula nereis*) and the caspian tern (*Hydroprogne caspia*) have been recorded at the site. Further, the Critically Endangered orange-bellied parrot utilises the fringes of Corner Inlet and several islands within for feeding and roosting habitat. Other non-avian fauna like amphibians and marine mammals also occur in the site. Species of significance include the growling grass frog (*Litoria raniformis*), bottlenose dolphins (*Tursiops truncatus s. str*), Australian fur seals (*Arctocephalus pusillus),* as well as occasional records of common dolphins (*Delphinus delphis*), New Zealand fur seals (*Arctocephalus forsteri*), leopard seals (*Hydrurga leptonyx*) and southern right whales (*Eubalaena australis*) (DSEWPaC 2011c).

Corner Inlet encompasses four ports which service the commercial fishing industry, coastal trade and offshore oil and gas production. It is one of only three estuaries or bays where commercial fishing is allowed in Victoria and has an estimated annual wholesale value of approximately 5-8 million dollars (DSEWPaC 2011c). The inlet is a popular visitor destination for tourism and recreation predominantly relating to nature-based activities including recreational fishing, boating/yachting, sightseeing, horse riding, scuba diving, bird watching, and bushwalking (DSEWPaC 2011c). The inlet is also utilised for scientific research programs investigating themes like wetland health and ecology, measuring and mapping of biodiversity, marine pests and ecosystem management.

The region includes an estimated 31 shipwrecks within and adjacent to the site which represent aspects of European settlement and the history of European trade and shipping (DSEWPaC 2011c). Strong cultural ties and practices are held to the area by theÁrataulong Clan of the Gunai/Kurnai Tribe and multiple sites have been recorded in the area including scarred trees, burial sites, artefact scatters, camps and shell middens (DSEWPaC 2011c). Other groups identifying the area as their Traditional Country include the Boon Wurrung people and the Bunurong people.

4.4.5.2. East Coast Cape Barren Island Lagoons

The East Coast Cape Barren Island Lagoons (ECCBIL) are located on Cape Barron Island part of the Furneaux Group in Bass Strait about 50 km from Cape Portland, the north-eastern tip of Tasmania. The lagoons are a complex of freshwater, brackish, saline and sometimes hypersaline lagoons, wetlands and estuaries which have been formed due to the slow development of a dune system in an easterly direction, leaving shallow sandy soils, depressions and intermittently flowing water courses (DSEWPaC 2012e). The site is characterised by having a diversity of wetlands and lagoons lying in close proximity to each other along with an almost complete absence of human disturbance. There are roughly 100 separate wetlands, mostly of small size, stretching across the eastern coast of Cape Barren Island with main wetland types including estuarine waters, intertidal mashes, coastal brackish/saline lagoons and coastal freshwater lagoons (DSEWPaC 2012e).

A large range of Tasmanian wetland vegetation types occurs within the site which are important for maintaining the biological diversity of the bioregion and provide habitat for a wide range of fauna and flora. The lagoons may be important for birds as the extensive undisturbed shorelines provide potential resting habitat and nesting sites for shorebirds, waders and other birdlife. A study conducted at ECCBIL in March 1996, saw 63 species of birds recorded with 13 considered to be wetland dependent (DSEWPaC 2012e). However, currently there is insufficient data to evaluate the significance of ECCBIL for birds and the site does not meet the criterion to be classified as internationally important for waterbird species (DSEWPaC 2012e).

Due to the remote location of the ECCBIL the wetlands have relatively no human disturbance and therefore are not seen as significant from a tourism or recreation perspective. Cape Barren Island has a significant place in history for the Tasmanian First Nations community. Although there has been no direct assessment of values within the ECCBIL, there are traditional activities associated with lagoon environments, including gathering plant and animal resources (DSEWPaC 2012e).

4.4.5.3. Gippsland Lakes

Gippsland Lakes is located east of the Latrobe Valley and south of the Eastern Highlands in the State of Victoria, approximately 300 km east of Melbourne. It consists of a group of coastal lagoons separated from the sea by a barrier system of sand dunes and fringed on the seaward side by the Ninety Mile Beach (DSEWPaC 2010). The Gippsland Lakes system is linked to the sea by an artificial entrance, opened in 1889, where the town of Lakes Entrance is now situated. The site supports a diversity of wetlands, 11 wetland types, including coastal lagoons, subtidal seagrass and algal beds, and a range of saline, brackish and freshwater marsh environments (DSEWPaC 2010).

This site supports a range of ecosystem services/benefits counting nationally and internationally threatened flora and fauna wetland species, including 86 waterbird species, which utilise the habitat for critical processes like feeding, breeding and resting (DSEWPaC 2010). Several threatened, migratory and marine bird species protected under various international agreements including the fairy tern, little tern (*Sterna albifrons*) and the red knot (*Calidris canutus*) have been recorded at the site. Other non-avian fauna also use the site for foraging, breeding or as habitat refuge; many have conservation value, such as the Australasian grayling (*Prototroctes maraena*) (EGCMA 2015). Further, the wetlands support threatened amphibian species like the growling grass frog and the green and golden bell frog which have known and potentially suitable habitat occurring within the site.

Tourism and recreation are described as the most important uses of the Gippsland Lakes having a major impact on employment and the economic wealth of the region. Visitors can undertake a range of recreational activities including bushwalking, boating and sailing, fishing, swimming, camping, hunting, bird watching, horse riding, picnicking and sight-seeing (DSEWPaC 2010). The Gunaikurnia people have been custodians of the waterways in the Gippsland region, including the Ramsar site, for thousands of years. These waterways provide value to the people through the availability of food, materials, culture and travel. Specific cultural values of the Gunaikurnia people associated with Gippsland lakes include Legend Rock which is located within the Ramsar site in the shallow water of Bancroft Bay and holds great spiritual value and serving as a reminder for its people to remember the laws of the land (EGCMA 2015).

4.4.5.4. Glenelg Estuary and Discovery Bay Wetlands

The Glenelg Estuary and Discovery Bay wetlands is located in western Victoria adjacent to the Victorian-South Australian border and approximately 430 km west of Melbourne in the Glenelg Hopkins catchment management area. The geology, topography and soils are described as belonging to three main systems: the freshwater wetlands, the Glenelg Estuary and associated Oxbow Lake and the dune fields and beach (DELWP 2017a). The freshwater wetlands consist of several wetland complexes which lie behind the dune system and connect to Glenelg Estuary at Oxbow Lake. Glenelg Estuary is a salt wedge estuary that is comprised of the long channel as well as Oxbow Lake and is seasonally closed. Representing the most active sands of the Victorian coastline, Discovery Bay forms a long sandy intertidal beach, broken at intervals by outcrops of underlying rocky limestone (DELWP 2017c).

The site supports a diversity of wetlands, 10 wetland types, brought about by the interactions between geomorphology, hydrology and vegetation (DELWP 2017c). This diversity enables a variety of species, including 95 species of waterbirds, to utilise the wetlands for critical process like feeding and breeding. Several threatened, migratory and marine bird species protected under various international agreements including the fairy tern, curlew sandpiper (*Calidris ferruginea*) and the hooded plover (*Thinornis rubricollis rubicollis*) have been recorded at the site. Other non-avian fauna also use the site for foraging, breeding or as habitat refuge; many have conservation value, such as the Yarra pygmy perch (*Nannoperca obscura*) (DELWP 2017a). Further the wetlands support threatened amphibian species like the growling grass frog which is supported by the freshwater wetlands of the site.

The area is popular for recreational and tourism activities, including sightseeing, walking, camping, and recreational fishing. Visitor numbers to the area, including the Lower Glenelg National Park and Discovery Bay Coastal Park can exceed 100,000 annually (DELWP 2017c). The Gunditjmara First Nations people have a living association with the Ramsar site, which has great cultural significance for them, as it is part of their Koonang (sea) and Bocara Woorrowarook (river forest) country. For Gunditjmara people, ‘Country’ includes all living things, people, plant and animals alike and embraces the season stories and spirits of creation (DELWP 2017c).

4.4.5.5. Lavinia

The Lavinia Ramsar site is located on the north-east coast of King Island and is situated between Boulder Point at its northern end and Cowper Point, approximately 12 km north of Naracoopa, at its southern end (Newall and Lloyd 2012). The northern section of the site extends approximately 8 km inland. Critical components and processes identified in the Ramsar site by Newall and Lloyd (2012) include wetland vegetation communities with regionally rare flora and fauna species like the orange-bellied parrot, King Island scrubtit and the green and gold frog. Further, the Lavinia site supports populations of seabirds and migratory birds which are critical to the sites ecological character.

The site is currently used for conservation and recreation, including boating, fishing, camping and off-road driving. There are artifacts of First Nation Australian occupation on King Island that date back to the last ice age when the island was connected to Tasmania and mainland Australia via the Bassian Plain. There are four distinct (and at times overlapping) ecosystem units (Newall and Lloyd 2012) within the Lavinia site which are described below.

The **sea elephant estuary ecosystem** unit receives its freshwater from the largest river on King Island (the Sea Elephant River) and drains into Bass Strait midway along the east coast. Along with containing significant saltmarsh areas that provide feeding and roosting habitat for the Critically Endangered orange-bellied parrot the estuary contains a coastal lagoon and an actively developing sand spit. Socio-economic values of the estuary include recreational fishing and a commercial aquaculture facility (an oyster farm) (Newall and Lloyd 2012).

The **coastal strip ecosystem** unit covers the entire coast of the site, from Boulder Point in the north to Cowper Point in the south, a distance of approximately 22 km. This ecosystem includes the coastal calcareous sand beaches of the site as well as the foredunes. The coastal strip contains important seabird rookeries and overlaps with the Sea Elephant Estuary Ecosystem (Newall and Lloyd 2012).

The **dunes ecosystem** unit consists of three main subcomponents – the new dunes, the old dunes and the interdunal swamps (Nook Swamp). The old dunes formed approximately 120,000 years ago during considerably higher sea levels and are situated inland of the new dunes (Pemberton 2004), which commenced forming within the last 10,000 years and form a rim around King Island. Between the old and new dune systems, there is a series of lagoons, lakes wetlands and peatlands, forming in the interdunal depressions (Newall and Lloyd 2012).

The **northern sandsheet ecosystem** unit is a Quaternary sand plain which forms flat to undulating country inland of the dunes ecosystem. The plains are thought to have originated during periods of relatively high Quaternary sea levels, in which marine-estuarine sedimentation occurred and formed the plain onto which terrestrial sediments were subsequently deposited. Vegetation of the ecosystem includes an extensive successional mosaic of sedgeland, heath and scrub (Duncan 1986) and also heathy woodlands (D'Costa et al. 1993).

4.4.5.6. Logan Lagoon

Logan lagoon is located in the south-east corner of Flinders Island in the Bass Strait, Tasmania, approximately 6 km north-east of Lady Barron and is part of an extensive eastern Flinders Island parallel dune–coastal barrier system (DSEWPaC 2012d). The low-lying wetland-dependent vegetation around the lagoon is characteristic of a coastal wetland, comprising submerged macrophytes, saltmarsh, herblands and grasslands, some of which are of conservation significance in the Tasmanian Bioregion.

The site supports a range of fauna species which utilise the ecosystem as an important resting and feeding habitat, specifically for resident and migratory birds. Over 160 bird species have been recorded on Flinders Island, many of which occur in the site (DPAW 2000). Several threatened, migratory and marine bird species protected under various international agreements including the Australasian bittern (*Botaurus poiciloptilus*), fairy tern and the curlew sandpiper have been recorded at the site (DSEWPaC 2012d). Other non-avian fauna also use the site for foraging, breeding or as habitat refuge; many have conservation value, such as the endangered freshwater fish, the dwarf galaxias (*Galaxiella pusilla*) and the green and golden frog.

Alluvial processes occurring within Logan Lagoon contribute to the formation of geological features such as shorelines and sand dunes via the deposition of sediments. Accumulation of organic matter provides nutrients for flora communities which help to stabilise the dune systems (DSEWPaC 2012d). Logan lagoon contains two sites listed on the Tasmanian Geoconservation Database; Logan Lagoon Holocene Shorelines and Planter Beach Coastal Barrier System, which are of conservation significance for Tasmania.

The site is valued as a site for conservation education, scientific research, recreation, and tourism. Activities occurring at Logan lagoon include recreational fishing, canoeing, bird watching and walking and sightseeing. The Logan Lagoon Conservation Area Management Plan identifies that no systematic archaeological surveys have been undertaken in the conservation area and therefore no sites have been identified. Further there has been little work done on the cultural heritage resource of the conservation area (DPAW 2000).

4.4.5.7. Piccaninnie Ponds Karst Wetlands

Piccaninnie Ponds Karst Wetlands is located in South Australia 32 km south-east of Mount Gambier, bordered by Victoria to the east and the Southern Ocean to the south. The site covers 862 ha and is remnant of an extensive system of wetlands that once occupied much of the south-east of South Australia.

The site is a unique karst wetland system which provides habitat for an extensive and diverse assemblage of endangered or rare species. The orange-bellied parrot is known to utilise the site in the winter for roosting and feeding. The wetlands provide habitat for 79 waterbird species including 24 species listed under international agreements and 50 Australian migratory or marine species (Butcher et al. 2011). Non-avian fauna utilise the site for biologically important behaviours, including the Yarra pygmy perch and dwarf galaxias who breed and spawn within the RAMSAR site.

The wetlands receive around 20,000 visitors a year with the main attraction being cave diving. The clear waters provide snorkelling and diving opportunities in the series of underwater caverns of the underground hydrological systems (Butcher et al. 2011). Other activities include bushwalking, bird watching, education, nature observation, and recreational fishing.

The wetlands have high cultural value. The Traditional Owners of the land, the Bunganditj (Boandik) people, and local Indigenous people of the South East have a strong connection with the site, recognising the importance of groundwater discharge and the connection between culture and wetland health. The wetlands traditionally provided food and resources to the Bunganditj people, with middens and other evidence of occupation remaining today (Butcher et al. 2011).

4.4.5.8. Port Phillip Bay (Western Shoreline) and Bellarine Peninsula

The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site is located in the western portion of Port Phillip Bay, near the city of Geelong in Victoria. The site covers 22,650 ha and includes freshwater wetlands, estuaries, intertidal shorelines and sub inland saline wetlands (DELWP 2018). The site provides important connective habitat for migratory bird species, habitat for fauna staging and foraging, is home to First Nations cultural sites, provides use of resources, and a site for commercial and recreational activities and education initiatives.

The Port Phillip Bay Ramsar site consists of a number of component areas that include parts of the shoreline, intertidal zone and adjacent wetlands of western Port Phillip Bay, extending from Altona south to Limeburners Bay and parts of the shoreline, intertidal zone and adjacent wetlands of the Bellarine Peninsula, extending from Edwards Point to Barwon Heads and including the lower Barwon River. It is protected under the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan (DELWP 2018), which defines the key values as:

- Natural function and representativeness – the interactions between physical, biological and chemical components of all eight wetland types that enable them to perform certain natural functions and making them a vital element of the landscape.
- Flora and fauna – contain the genetic and ecological diversity of the flora and fauna of the region, with at least 332 floral species (22 state threatened species) and 304 species of fauna (29 threatened species).
- Waterbirds – provides habitat for migratory shorebirds, including some of international and national importance and is used as a site for long-term monitoring of species.
- Cultural heritage – many First Nations sites, particularly shell middens and artefact scatters have been found at the site.
- Economic – use of natural resources in agriculture, fisheries, recreation and tourism.
- Education and interpretation – offer a wide range of opportunities for education and interpretation of wildlife, marine ecosystems, geomorphological processes and various assemblages of aquatic and terrestrial vegetation.

4.4.5.9. Western Port

The Western Port Ramsar site is located approximately 60 km south-east of Melbourne and consists of large shallow intertidal areas divided by deeper channels with adjacent narrow strips of coastal land (DELWP 2017b). In 1982 a large portion of Western Port Bay was specified of international importance especially as waterfowl habitat. Westernport Bay is valued for its terrestrial and marine flora and fauna, cultural heritage, recreational opportunities and scientific value. The area supports four wetland types including substantial intertidal areas supported by mangroves, saltmarsh, seagrass communities and unvegetated mudflats, which are significant as shorebird habitat.

Additionally, the saltmarsh and mangroves filter pollutants, trap and process nutrients, stabilise sediments and protect the shoreline from erosion (DELWP 2017b). The intertidal mudflats provide a significant food source for migratory waders, making it one of the most significant areas in south-east Australia for these birds. The interaction between critical processes and components provide habitat for many waterbirds. The mangrove and saltmarsh vegetation are of regional, national and international significance because of the role in stabilising the coastal system, nutrient cycling in the bay and providing wildlife habitat (Ross 2000). There are three state marine parks within the Ramsar site (Yaringa, French Island and Churchill Island MNPs), one National Park and it has been designated as a Biosphere Reserve under the UNESCO's Man and the Biosphere program. There are numerous community and government projects that help monitor, protect, raise awareness and educate the community about the Ramsar site wetland (Brown and Root 2010). The site is protected under the Western Port Ramsar Site Management Plan (DELWP 2017b), which defines the key values as:

- Flora and Fauna – soft sediment and reef habitats support a diversity and abundance of marine invertebrates and fish and provides habitat to six species of bird and one fish species that are listed as threatened under the EPBC Act.
- Rocky reefs comprise a small area within the Ramsar site, but include the intertidal and subtidal reefs at San Remo, which support a high diversity, threatened community and Crawfish Rock, which supports 600 species (Shapiro 1975).
- Waterbirds – supports bird species, including 115 waterbird species, of which 12 are migratory waders of international significance and provides important breeding habitat for waterbirds, including listed threatened species.
- Cultural Heritage – the Ramsar site is within the traditional lands of the Boonwurrung, who maintain strong connections to the land and waters.
- Economic – the site contains the commercial Port of Hastings that services around 75 ships per year and contributes around $67 million annually to the region's economy.

4.4.5.10. Wetlands of National Importance

As a key part of their commitment to recognising Australia's most important wetlands, all state, territory and commonwealth governments have jointly compiled a Directory of Wetlands of National Importance in Australia. There are 79 Wetlands of National Importance that intersect with the EMBA, as shown in Figure 4-12.

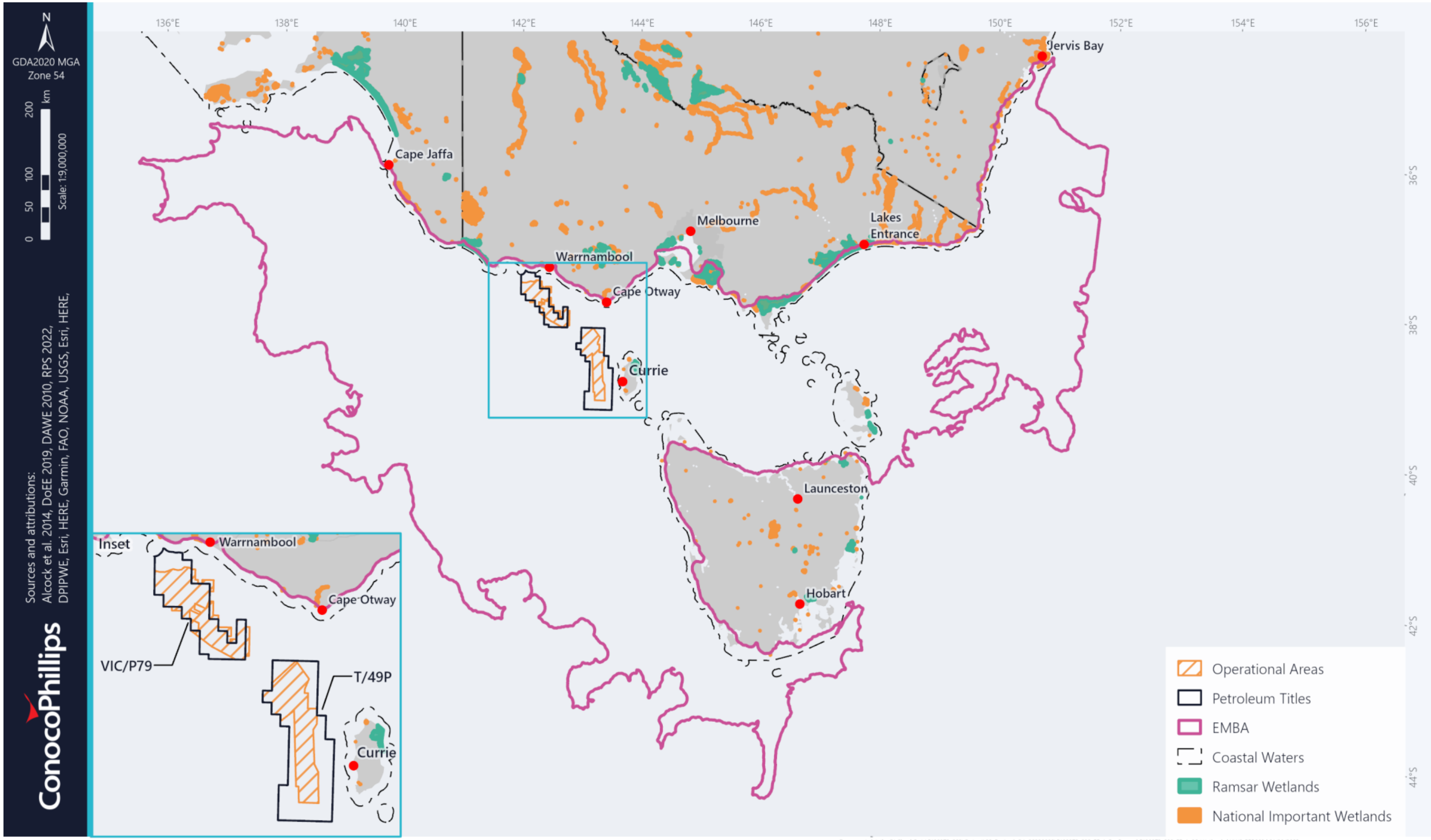


Figure 4-12: Wetlands within the EMBA

4.4.6. State Protected Areas – Marine

4.4.6.1. Tasmania

In Tasmania there are 41 marine reserves that have been declared in State waters, including one at Macquarie Island, with the objective of protecting the biological diversity and resources of coastal waters. The term 'marine reserves' broadly covers both marine nature reserves and marine conservation areas (DPIPWE 2021). Identified state-wide pressures on the Tasmanian marine environment relevant to the activity include:

- Climate change including ocean acidification and sea temperature rise
- Commercial fishing
- Marine pollution
- Introduction and establishment of IMS (Carr and Minshull 2020).

Of the 41 MPAs in Tasmania, 16 are intersected by the EMBA and are discussed below. There are no marine protected areas (or MPAs) around King Island.

Kent Group Marine Reserve (IUCN Category II) protects 29,000 ha in the middle of the Bass Strait and includes a cluster of five granitic islands and several islets that are situated halfway between Wilsons Promontory in Victoria and Flinders Island off Tasmania's north-eastern tip. The marine protected area covers all waters 3 nautical miles offshore. The reserve is a meeting place of three major ocean currents which bring a richness of nutrients and supports a unique diversity of marine life resulting in an extraordinary high number of fish species (TASPAWS 2020a). Judgement Rocks is home to the largest Australian fur seal breeding colony in Tasmania who make their home on the rocky outcrops. The islands are also an important refuge for sea birds like fairy prions, short-tailed shearwaters and little penguins (TASPAWS 2020a). The reserve is only accessible by boat and offers no facilities, however any visitors to the park can enjoy recreational activities such as swimming, snorkelling and diving. The convergence of currents along with an unforgiving coastline has resulted in the Kent Group National Park being the home of over 20 recorded shipwrecks (TASPAWS 2020a). Two of these wrecks, Bulli and Karitane, are visible in the shallow waters of West cove and Squally cove respectively (TASPAWS 2020a).

The Kent Group is part of the original land bridge that connected what we now know as Tasmania and Victoria which was submerged approximately 10,000 years ago creating islands. This resulted in challenging conditions for the First Nations people living there. Today, the Kent Group is a rich cultural landscape because of the occupation of these resilient people, and today's First Nations community have an ongoing connection to place (TASPAWS 2020a).

Port Davey Marine Reserve (IUCN Category II) protects 17,753 ha and is located in the Southwest National Park and the Tasmanian Wilderness World Heritage Area and includes Port Davey, Bathurst Harbour and Nathurst Channel. Bathurst Harbour and Channel display an unusual underwater landscape created by the deep layer of dark, tannin-rich freshwater which overlies the tidal saltwater (TASPAWS 2008). This process is called stratification and results in nutrient and oxygen poor waters due to limited sunlight penetration in the water column. This limits the growth of marine plants and instead creates suitable habitat for a diverse assemblage of marine invertebrates. Most of these invertebrates are sessile filter feeders who feed on the microorganisms and nutrients that flow past. Other species commonly found in this unique ecosystem include eels, sharks and skates, like the endangered Port Davey skate which is found within this reserve (TASPAWS 2008). The rest of the reserve displays a more typical Tasmanian seabed where habitats include exposed reefs, steep gorges, bays and inlets, kelp forests, seagrass meadows, muddy and gravelly sediments and the water column. Port Davey was the homeland of the Ninunee people and the Needwunnee people who took advantage of the variety of marine life associate with the area (TASPAWS 2008).

The **Cloudy Bay Lagoon Marine Conservation Area** (IUCN Category VI) protects 480 ha and is located in the Cloudy Bay Lagoon in the south of Bruny Island. The area incorporates the Cloudy Bay Lagoon inlet system which contains seagrass and shallow sediment microalgae (TASPAWS 2020b).

The **Hippolyte Rocks Marine Conservation Area** (IUCN Category VI) protects 535 ha and surrounds the Hippolyte Rocks off the east coast of the Tasman Peninsula close to Cape Hauy. The abundant marine life in the area sustains breeding populations of protected species such as short-tailed shearwaters, fairy prions, common diving-petrels and black-faced cormorants (TASPAWS 2020b). The area is also significant for migratory birds and seabirds including albatrosses and petrels, and contains feeding grounds for Australasian gannets, white-bellied sea eagles, and little penguins. Further, the conservation area is also a large seal haul out site which provides hunting grounds for the white shark (TASPAWS 2020b).

The remaining 13 reserves intersected by the EMBA are listed below due to limited availability of information.

- Murkay Islets Conservation Area (IUCN Category V) – protects 14.06 ha
- Shell Islets Conservation Area (IUCN Category V) – protects 4 ha
- Montagu Beach Conservation Area (IUCN Category V) – protects 336 ha
- Howie Island (IUCN Category VI) – protects 40 ha
- Lees Point Conservation Area (IUCN Category VI) – protects 389 ha
- West Inlet Conservation Area (IUCN Category VI) – protects 70 ha
- Reef Island Conservation Area (IUCN Category VI) – protects 6 ha
- Unnamed (Badger Corner) Conservation Area (IUCN Category V) – protects 500 ha
- Unnamed (Duck Bay) Conservation Area (IUCN Category V) – protects 1,874 ha
- Arthur Bay Conservation Area (IUCN Category VI) – protects 733 ha
- Marriott Reef Conservation Area (IUCN Category V) – protects 12 ha
- Chappell Islands Nature Reserve (IUCN Category IV) – protects 200 ha
- Moriarty Rocks Nature Reserve (IUCN Category la) – protects 2 ha.

4.4.6.2. Victoria

Victoria has a representative system of 30 MPAs which include Marine National Parks (MNP), Marine Sanctuaries (MS), Marine and Coastal Parks, Marine Parks and a Marine Reserve. Victoria's MPAs span 5 marine bioregions and aim to conserve and protect ecological processes, habitats and associated flora and fauna. Parks Victoria manages the MPAs and describes a variety of state-wide threats that affect all MPA those relevant to the activity include:

- Climate change effects including sea level rise, warming sea surface temperature and increasing ocean acidity
- Seabed disturbance in shallow areas
- Oil and chemical pollution
- Introduction and establishment of IMS (PV 2022a).

Of the 30 MPAs in Victoria, 23 are intersected by the EMBA and are discussed below.

The **Arches Marine Sanctuary** (IUCN Category III) protects 48 ha and is located 20 km south offshore the Port Campbell township where the environment is characterised by high energy waves and cool water. The main habitats protected by the Marine Sanctuary include the water column, subtidal soft sediments, and subtidal limestone reef made up of formations such as canyons, tunnels, arches, caverns, ledges and vertical sink holes (PV 2006c). Ecological significance comes from the diversity of life supported by the limestone formations like algae, sponges and sea stars. The water column is home to a number of pelagic organisms including jelly fish, phytoplankton, zooplankton and a variety of fish. Marine mammals and seabirds are also known to frequent the area. Species of conservation significance include the leatherback turtle, the SRW, the grey nurse shark and the white shark (PV 2006c). Due to its diversity of marine flora and fauna and the limestone formations of rocky arches and canyons; this Marine Sanctuary is renowned for its diving. Sea Country is an integral element of First Nations tradition and indications are that the Arches Marine Sanctuary is part of Country of Kirrae Whurrong and Country of Gadubanud who flourished along this coastline pre-European settlement (PV 2006c).

The **Barwon Bluff Marine Sanctuary** (IUCN Category III) protects 17 ha and is located at Barwon Heads where the Barwon River enters the Bass Strait. The reef system forks east and west which results in a diversity of habitats in a small area including a system of intertidal and subtidal reefs and beach areas at the foot of the Barwon Heads Bluff (PV 2007a). The eastern reef is basalt and was formed by lava flow over 1 million years ago while the western reef is sandstone. The area is further known for its diversity of marine life ranging from invertebrate communities of mussels to the communities of fish living within kelp forests and subtidal reefs. Even the beaches and intertidal platforms provide roosting, feeding and breeding areas for migratory and threatened seabirds and shorebirds (PV 2007a). The intertidal area of this Marine Sanctuary continues to be valued by schools and other groups for marine education while offshore areas are popular for snorkelling and diving. Barwon Bluff Marine Sanctuary is part of Country of the Wathaurong people who continue to have a close relationship with the area.

The **Beware Reef Marine Sanctuary** (IUCN Category II) protects 220 ha and is a 70 m long isolated rock that rises abruptly out of the sandy seafloor located 5 km south east of Cape Conran. The reef showcases a unique mix of both warmer and cooler temperate species, due to its location between the eastern Australian current flowing from the north and a cooler westerly current flowing through Bass Strait (PV 2022b). The reef is characterised by lush kelp beds and coralline algae and is frequented by New Zealand fur seals, Port Jackson sharks and humpback whales during their southern migration (PV 2022b). Further, this MS also contains the remains of numerous shipwrecks making it a popular location for recreational divers. Beware Reef Marine Sanctuary is part of a First Nations cultural landscape and the connection that Traditional Owners have to these waters is recognised and respected by the Victorian Government.

Bunurong Marine National Park (IUCN Category II) protects 2,046 ha and is located on the Bass Strait coastline between Inverlock and Wonthaggi and extends from the high-water mark offshore 3 nautical miles. The main habitats protected by the MNP include intertidal and subtidal soft sediment, extensive sandstone intertidal reefs, subtidal reefs (including extensive shallow reefs) and the water column. The subtidal rocky reefs which extend several km from the shore are quite different to those in other parts of Victoria with shallow subtidal reefs rich in species of red and brown algae lacking the more typical kelp species of golden kelp and crayweed (PV 2006a). Bunurong Marine National Park provides feeding and roosting habitat for 31 conservation listed seabirds and shorebirds including the white-faced storm petrel and wandering albatross. A variety of conservation listed marine mammals are also known to frequent the area and feed on the planktonic and pelagic organisms. There have been sightings of humpback whales, SRWs and the Australian fur seal in the MNP (PV 2006a). Visitors can enjoy a range of beach activities such as snorkelling, diving, rock pooling and walking in the area. Further, First Nations tradition indicates that the area is part of the Country of the Boonwurrung First Nations people, who are traditionally and culturally associated with the MNP.

Cape Howe Marine National Park (IUCN Category II) protects 4,060 ha and is located approximately 550 km east of Melbourne and 15 km east of Mallacoota with the eastern boundary of the MNP aligning with the Victoria – NSW border. There are a variety of marine ecological communities, including sandy beaches, intertidal and subtidal rocky reefs, subtidal soft sediments and the water column (PV 2006d). Eastern and southern temperate species not often seen in other parts of Victoria co-occur due to the warm water of the East Australian Current mixing with the cool southern waters. These habitats provide important feeding and roosting grounds for 38 conservation listed shorebird and seabird species like the short-tailed shearwater and the little tern. Further, hundreds of humpback whales are known to pass through the MNP on their southern migration and are sometimes followed by pods of killer whales (PV 2006d). Other notable species that utilise the area include SRWs, little penguins and both New Zealand and Australian fur seals. Although the MNP is difficult to access, visitors who chose to make the trip have the opportunity to undertake remote, self-reliant nature-based activities like hiking and boating. There are many ships recorded as missing in the area, however there is only one listed shipwreck within the MNP, Gilbert San (1929), which has remains visible from shore (PV 2006d). First Nations tradition indicates that the Cape Howe MNP is part of the Country of the Bidwell people and that other First Nations people, including the Yuin Nation, may now also have an association with the area.

Churchill Island Marine National Park (IUCN Category II) protects 670 ha south of Rhyll extending along 11 km of Phillip Island eastern shoreline. It is one of three MNPs that cover the Western Port Bay including the Western Port Ramsar site, the East Asian-Australasian Flyway, and the Mornington Peninsula and Western Port UNESCO Biosphere Reserve (PV 2007b). The MNP protects state and regionally significant intertidal mudflats, seagrass beds, and mangroves. These habitats provide important feeding and roosting grounds for conservation listed species like the orange-bellied parrot and a variety of marine invertebrates including the extremely rare 'living fossil' lampshell or brachiopod, *Magellania flavescens* (PV 2007b). The MNP is located within Tourism Victoria's Phillip Island and Gippsland discovery product region which provides recreational opportunities for bird watching, boating, kayaking as well as an opportunity for marine education and ecotourism. First Nations tradition indicates that the park is a part of Country of the Boonwurrung people. Artefacts and middens along the Western Port coast indicate that the Boonwurrung people have inhabited these areas for at least 6000 years and still have strong associations to the area (PV 2007b).

Corner Inlet Marine National Park (IUCN Category II) protects 1,550 ha adjacent to Wilsons Promontory National Park and linked to Corner Inlet Marine and Coastal Park approximately 180 km south-east of Melbourne. The MNP is sheltered within Corner Inlet and comprises two separate sections of the park which are on the south-eastern coast. It is the only MNP in Corner Inlet and preserves areas of Corner Inlet Ramsar site and the East Asian-Australasian Flyway which are in place to protect the significant seagrass beds and wading bird habitats (PV 2005b). The MNP encompasses a wide variety of marine habitats from deep channels to extensive seagrass beds, tidal sand and mud flats, sandy beaches, rocky reefs, mangroves and saltmarsh. These habitats provide important feeding and roosting areas for up to 50% of Victoria's migratory shorebird population and homes for a high diversity of invertebrates and four of Victoria's five main seagrasses species. Further, the orange-bellied parrot utilises the fringes of the mangrove and saltmarsh habitats for feeding and roosting (PV 2005b). Visitors can enjoy a variety of boat-based activities including power boating, sailing and kayaking as well as offering tranquil waters for snorkelling and diving with a diverse range of marine life within the seagrass community. First Nations tradition indicates that the park is part of the Country of the Gunai/Kurnai First Nations people. It is a place integral to the Dreaming of the Gunai/Kurnai people, and is highly significant to Traditional Owners (PV 2005b).

Discovery Bay Marine National Park (IUCN Category II) protects 2,770 ha adjacent to Cape Bridgewater, 20 km west of Portland, 300 km west of Melbourne and extends from the high-water mark offshore for 3 nautical miles. The coastline is formed from the remains of a volcano that has spewed lava over the last million years and cooled into hard basalt rock resulting in the MNP being part of the largest coastal basalt formation in western Victoria (PV 2007f). The main habitats protected by the MNP include sandy beaches, intertidal reef, limestone reef, basalt reef, sand and the water column. Reefs are often covered in rich sponge gardens and algae and composed of thick growths of sessile invertebrates including sponges, ascidians, bryozoans and gorgonians which in turn support schools of fish. The water column, which is influenced by the Bonny Upwelling, encourages the growth of microscopic plants and animals providing feeding grounds for notable species such as rock lobster, blue whales, SRWs, common diving petrels and wandering albatrosses (PV 2007f).

Unlike other areas in Victoria there are relatively few people who utilise this MNP for surfing, boating or diving due to the unpredictable weather on the exposed coastline. Instead, visitors enjoy the views from points above the high watermark at The Blowholes or on the Great South West Walk (PV 2007f). Further, in the 1800's Portland became an important shipping hub which resulted in a number of shipwrecks occurring in the vicinity of the MNP. There is one shipwreck, Marie (1851), thought to be within the MNP however the exact location is unknown (PV 2007f). First Nations tradition indicates that the park is part of Gournditch-Mara Country and that the natural values of the MNP are of significant interest based on spiritual connection to the Sea Country and a history of marine resource use.

The **Eagle Rock Marine Sanctuary** (IUCN Category III) protects 17 ha and is located approximately 40 km south-west of Geelong, close to Aireys Inlet extending from the high-water mark offshore for 300 m. The main habitats protected by the sanctuary include intertidal and subtidal soft sediment, intertidal and subtidal reefs, and the water column. Intertidal platforms are home to 25 different species of algae and in particular brown algae Neptune's necklace (*Hormosira banksii*) which is a key habitat forming plant (PV 2005). A variety of invertebrates, fish, sharks and rays make their home within the sanctuary. Further, the Sanctuary supports a variety of conservation listed species such as the Caspian tern, short-tailed shearwater and has occasionally been utilised as a haul out site for the Australian fur seal (PV 2005). Located below the lighthouse at Airley's Inlet visitors can enjoy snorkelling, diving, and exploring the rock pools allowing for the observation of a variety of marine life. First Nations tradition indicates that the EMBA is part of the Country of the Wathaurong people and that First Nations people had a long association with this region. The Wathaurong were composed of at least 25 family-based clans that controlled specific areas of land and the Tjuraalja clan belong to the Country between Anglesea and the Painkalac Creek, including Eagle Rock Marine Sanctuary (PV 2005).

French Island Marine National Park (IUCN Category II) protects 2,800 ha and is located 10 km south of Tooradin and 60 km south-east of Melbourne covering 14.5 km of coastline. It is one of three MNPs that cover the Western Port Bay including the Western Port Ramsar site, the East Asian-Australasian Flyway, and the Mornington Peninsula and Western Port UNESCO Biosphere Reserve (PV 2007b). This MNP is characterised by mangrove and salt marsh communities, coastal heaths and open woodlands which provide important habitat for an array of species. Over 230 bird species have been recorded on French Island including species like the orange-bellied parrot who utilise the intertidal shoreline for feeding and roosting (PV 2007b). Further, the mudflats support a variety of invertebrates and other small animals which are preyed upon by many migratory waders. The MNP is located within Tourism Victoria's Phillip Island and Gippsland discovery product region which provides recreational opportunities for bird watching, day trips, swimming and surfing as well as an opportunity for marine education and ecotourism. First Nations tradition indicates that the MNP is part of Country of the Boonwurrung people. Artefacts and middens along the Western Port coast indicate that the Boonwurrung people have inhabited these areas for at least 6000 years and still have strong associations to the area (PV 2007b).

Marengo Reefs Marine Sanctuary (IUCN Category III) protects 12.5 ha and is located 150 m offshore in Mounts Bay and includes a reef system known as Little Henty Reef. It is in Victorian state waters near Marengo and Apollo Bay and approximately 220 km south-west of Melbourne. The reef provides habitat for a high diversity of algae, invertebrate and fish species. Further the Australian fur seal has a haul out site on the Outer Reef which has been declared a Special Protection Area and biotic site of state significance (PV 2007d). The Sanctuary is only accessible by boat, sea kayak or swimming and provides recreational opportunities for snorkelling and scuba diving. First Nations people and their communities have a long association with the area and its resources and tradition indicates that the Sanctuary is part of Country of Gadubanud. Other First Nations communities, including the Kirrae Wurrung, Framlingham Aboriginal Trust, Wathaurung Aboriginal Cooperative and the Southern Otway's Indigenous Group have an association with the coastal region of this area (PV 2007d).

The **Merri Marine Sanctuary** (IUCN Category III) protects 29 ha and is located within the city of Warrnambol from Thunder Point to Breakwater Rock, including Middle and Merri Islands. The two offshore islands are the result of ancient sand dunes built up over thousands of years. The main habitats include intertidal and subtidal soft sediment and reef which provide important habitat for marine invertebrates and feeding and roosting habitat for shorebirds. Subtidal reefs are the dominant marine habitat where twenty-one different subtidal reef algal habitats have been identified (PV 2007e). Protected species such as the pot-bellied seahorse are frequently seen on the reef while larger marine mammals like Australian fur seals and Australian sea lions have been observed in the waters in and around the sanctuary. Further, Middle Island is a known nesting site for little penguins, black-faced cormorants and short-tailed shearwaters (PV 2007e). During consultation it was identified that the Middle Island Little Penguin colony is threatened by a range of processes including human resource use and predation by introduced canids; however, recent declines in the colony are not necessarily linked to canid predation (Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 3860; FB ID: 154; Event ID: 2690, FB ID: 143). This colony is located approximately 20 km from the closest point of the VIC/P79 operational area. The sanctuary is often visited by people for scuba diving, beach activities, to explore the rock pools or wildlife viewing. First Nations tradition indicates that the sanctuary is part of Country of Kirrae Whurrong and Country of Gunditjmara. The fresh water and range of food sources as well as access to intertidal areas made the area around the sanctuary an important site for many generations of First Nations people (PV 2007e).

Mushroom Reef Marine Sanctuary (IUCN Category III) protects 80 ha and is on the Bass Strait coast at Flinders near the western entrance to Western Port. The marine sanctuary extends from the high-water mark approximately 1 km offshore. Mushroom reef is composed of ancient basalt platforms and reefs that form a rich variety of marine microhabitats. Further, the beaches and intertidal areas within the sanctuary provide significant feeding and breeding habitat for migratory and threatened bird species. The reef is valued for its ecological and underwater recreation values as well as its potential for marine education. The accessibility of the subtidal reef provides opportunity for snorkelling and diving from the shore and is utilised for by scientists and teachers for education and research (PV 2007c). First Nations tradition indicates that the park is a part of Country of the Boonwurrung people and that it was an important landmark and area for gathering fish and shellfish.

Ninety Mile Beach Marine National Park (IUCN Category II) protects 2,750 ha of internationally significant sandy environment that is recognised for its exceptionally high diversity of marine invertebrates (PV 2006b). Located approximately 220 km south-east of Melbourne, 550 m north-east the township of Seaspray and extends from the high-water mark offshore 3 nautical miles. Low calcarenite reefs are scattered throughout the park which support a unique variety of invertebrates and sponges. A total of 860 different species were found within 10 m^2 of Ninety Mile Beach sand, making it one of the most biologically diverse marine environments in the world (PV 2006b). Although larger animals are less common some free-swimming fish species occur here feeding on the large variety of tiny organisms within the sand which subsequently draw in foraging young white sharks. Ninety Mile Beach MNP attracts thousands of visitors each year to the area and offers recreational activities such as beach walking, boating, swimming and surfing. Further, First Nations tradition indicates that the park is part of the Country of the Gunai/Kurnai First Nations people. It is a place integral to the Dreaming of the Gunai/Kurnai people, and is highly significant to Traditional Owners (PV 2006b).

Nooramunga Marine and Coastal Park (IUCN Category IV) is protected from the harsh surf of Bass Strait by barrier islands which resulting in quiet waters. The Park is composed of a network of shallow marine waters, isolated granite islands, intertidal mudflats and a complex of sand barrier islands. Common recreational activities include fishing, bird watching, swimming, and bush camping. Marine and coastal parks protect areas of coastal, intertidal or subtidal land which are of conservation significance, however they are not particularly representative of Victoria's unique and diverse marine environments.

Point Addis Marine National Park (IUCN Category II) protects 4,600 ha and is located approximately 25 km south-west of Geelong extending along 10 km of coastline and offshore 3 nautical miles. It is a high wave energy shoreline on the edge of the Bass Strait and is renowned for its surfing conditions and home to the annual Bells Beach international surfing competition (PV 2005). The main habitats protected by the park are beaches (including intertidal soft sediment), intertidal reefs, subtidal reefs, subtidal soft sediments (including unusually large rhodolith beds) and the water column. A unique feature of the MNP is Ingoldsby Reef which is one of the longest shallow offshore reefs in Victorian waters. It runs parallel with the coast for almost 5 km and ranges from sea level to depths of about 9 m (PV 2005). The Park is home to a diverse selection of organisms. Sessile species including sponges, soft corals and algae provide food and create habitat for fish and invertebrates. While the water column is home for a variety of planktonic and pelagic organisms which create desirable feeding habitat for marine mammals, marine reptiles and seabirds. Notable species include the wandering and shy albatrosses, the blue whale, the SRW, and the Australian fur seal (PV 2005).

The MNP is considered a popular tourist attraction in Victoria where visitors can enjoy snorkelling, diving, beach walks and surfing at Bells Beach. Further, Point Addis MNP protects 2 known shipwrecks, the Inverlocky (1902) which is visible from the surface in calm conditions and the Naiad (1881) which has no known relics (PV 2005). First Nations tradition indicates that the park area is part of the Country of the Wathaurong people, part of the Kulin Nation, and that First Nations people had a long association with this region. The Wathaurong were composed of at least 25 family-based clans that controlled specific areas of land and the Maamart clan belong to the land and waters, including Point Danger Marine Sanctuary and Point Addis MNP (PV 2005).

The Point Danger Marine Sanctuary (IUCN Category III) protects 25 ha and is located between Torquay and Jan Juc roughly 20 km from Geelong. It extends from the high-water mark at Point Danger offshore for approximately 600 m east and 400 m south and encompasses an offshore rock platform (PV 2005). The main habitats protected by the sanctuary include intertidal and subtidal soft sediment, intertidal and subtidal reefs, and the water column. The sanctuary is particularly recognised for its diverse sea slug fauna found on both intertidal and subtidal reefs with ninety-six species having been recorded, many of which are endemic (PV 2005). The water column is home for a variety of planktonic and pelagic organisms which creates desirable feeding habitat for a variety of conservation listed seabirds. Notable species include the wandering albatross, sooty shearwater and the common diving petrel. The MNP is considered a popular tourist attraction in Victoria where visitors can enjoy snorkelling, diving, kite surfing and rock pooling. First Nations tradition indicates that the park is part of the Country of the Wathaurong people, part of the Kulin Nation, and that First Nations people had a long association with this region. The Wathaurong were composed of at least 25 family-based clans that controlled specific areas of land and the Maamart clan belong to the land and waters, including Point Danger Marine Sanctuary and Point Addis MNP (PV 2005).

Point Hicks Marine National Park (IUCN Category II) protects 3,810 ha and is located 2 km east of Clinton Rocks spanning 9.6 km of coastline to Stable Bay. The main habitats protected by the MNP include the subtidal and intertidal soft sediments, subtidal and intertidal reefs and the water column. Eastern and southern temperate species not often seen in other parts of Victoria co-occur here due to the warm water of the East Australian Current mixing with the cool southern waters. Important characteristics include the canopy forming algae, common kelp, small understorey algae and encrusting and erect sponges (PV 2022c). Multiple conservation dependent species have been sighted in or in the immediate vicinity of the MNP and include the fairy tern, the Australian grayling, killer whale, and the southern right and humpback whale (PV 2022c). The main recreational activity enjoyed at Point Hicks MNP is diving. The clear water and forests of colourful sponges and invertebrates make the reefs in the parks some of the most interesting and beautiful in Victoria (PV 2022c). First Nations tradition indicates that the park is part of Country of Bidawal and Country of Gunai/Kurnai. The Monero-Ngarigo people also have an association with the coastal region of this area.

Port Phillip Heads Marine National Park (IUCN Category II) is located at the southern end of Port Phillip and comprises six sections; Point Lonsdale, Mud Islands, Swan Bay, Popes Eye, Portsea Hole, Point Nepean. The Park protects a wide range of habitats, including extensive rocky intertidal and subtidal reef systems, vast seagrass meadows, dynamic intertidal sandy beaches, sheltered subtidal soft substrates and a deep-water column environment. Swan Bay and Mud Islands are internationally significant shorebird habitats and form part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site listed under the Ramsar convention (PV 2006e). The MNP is characterised by colourful sponge gardens, tall kelp forests and dense seagrass beds which provide homes for diverse and abundant invertebrate and fish assemblages. Notable species that can be seen within the park include the orange bellied parrot, little penguins, bottlenose dolphins the Australian fur seal and the occasional southern right and humpback whale (PV 2006e).

Port Phillip is Melbourne's most important recreational area (PV 2006e). The Park contains some of Victoria's most treasured marine and coastal environments which are easily accessible from the Mornington and Bellarine Peninsulas and draws many visitors largely to observe nature. It is popular for diving and snorkelling and has internationally recognised dive sites. The waters around the entrance to Port Phillip, including the park, contain many heritage listed shipwrecks. There are 2 wrecks known within the MNP, Holyhead and George Roper which are part of Heritage Victoria's Underwater Shipwreck Discovery Trail (PV 2006e). First Nations tradition indicates that the Mornington Peninsula side of the park, including Mud Islands, is part of Country of the Boonwurrung and that the Bellarine Peninsula side of the park is part of Country of the Wathaurong.

Shallow Inlet Marine and Coastal Park (IUCN Category VI) is located in the sheltered shallow waters between Waratah Bay and Wilsons Promontory. Common recreational activities include fishing, bird watching, swimming, kite surfing and boating. Marine and coastal parks protect areas of coastal, intertidal or subtidal land which are of conservation significance, however they are not particularly representative of Victoria's unique and diverse marine environments.

Twelve Apostles Marine National Park (IUCN Category II) protects 7,510 ha adjacent to Broken Head and runs along the coast for 6 km and offshore 3 nautical miles. The majority of Twelve Apostles MNP begins at the high tidemark however additional land areas above this are also included such as Mutton Bird Island and offshore rock stacks (including the Twelve Apostles) (PV 2006c). The main habitats protected by the park include limestone cliffs, intertidal reef platforms, high profile subtidal rocky reefs, intertidal soft sediments, beaches, sandy subtidal soft sediment and the water column. The limestone reefs are interspersed by large areas of soft sediment covered by turbulent water providing a diverse range of habitats for many species. The Park is regarded as having the highest diversity of intertidal invertebrates on limestone reef in Victoria (PV 2006c). The Park is also home to a large breeding colony of little penguins located between the Twelve Apostles and London Bridge. While the water column is an important habitat for threatened fish species including the southern bluefin tuna and is thought to be used by the grey nurse shark and white shark (PV 2006c). Further species that can be found in the water column include migrating humpback whale and SRWs as well as both New Zealand and Australian fur seals.

The MNP is within Tourism Victoria's Great Ocean Road product region which is Victoria's most popular regional tourism destination receiving 14% of all tourist visits to Victoria (PV 2006c). Common recreational activities offered by the park include taking Gibson steps down the rock face for a beach walk, diving, surfing and fishing. Due to the wild seas, sheer cliffs and rock stacks within and surrounding the MNP it has been deemed the 'Shipwreck Coast' and has a tragic maritime history. There is one known shipwreck that has occurred within the MNP called Loch Arch (1878) which resulted in the deaths of 52 people and has artefacts still visible to this day (PV 2006c). Sea Country is an integral element in the culture of Kirrae Whurrong and Gadubanud peoples which has continued to this day among First Nations communities in the district. Countless generations of Kirrae Whurrong and Gadubanud people watched the powerful Southern Ocean sculpt the coastline and communities flourished until the arrival of Europeans (PV 2006c).

Wilsons Promontory Marine National Park (IUCN Category VI) protects 22,075 ha, including several offshore islands and is located approximately 220 km south-east of Melbourne in Victoria's southernmost marine waters. The MNP is the largest in Victoria, the only marine park in Flinders bioregion and is one of the richest marine ecosystems off the coast of Australia (PV 2006f). The MNP is characterised by granite habitats which include extensive heavy reefs with smooth surfaces, boulders and rubble and low-profile reefs. Additional marine habitats include shallow subtidal reefs, deep subtidal reefs, intertidal rocky shores, sandy beaches, seagrass and subtidal soft substrates. An abundance of marine flora and fauna make their homes in the MNP from large marine mammals to microscopic organisms with 68 species presumed to be at their eastern or western distributional limit (PV 2006f). The offshore islands support breeding colonies of Australia fur seals which draw in foraging white sharks over the summer months (PV 2006f) Further many oceanic birds including little penguins, short-tailed shearwaters and fairy prions utilise the island for roosting habitat in between foraging trips.

Wilsons Promontory MNP attracts visitors from all over and is an integral part of the Gippsland tourism industry which receives 7% of all tourism in Victoria (PV 2006f). Recreational opportunities range from diving and snorkelling to bird watching and exploring. The area and adjoining land have a long history of resource use and commerce which evidence of is present today including shipwrecks and relics of a whaling station and sealers settlement. At least 28 shipwrecks occurred within the MNP and 14 have been located (PV 2006f). First Nations tradition indicates that the MNP is traditionally and culturally associated with Country of Yiruk for the Gunai / Kurnai people, and Wamoom for the Boonwurrung people. First Nations tradition also indicates that the area contains many places and objects that are integral to the dreaming and culture of the Traditional Owners and are highly significant to First Nations people (PV 2006f).

Yaringa Marine National Park (IUCN Category II) protects 776 ha and is located in Watsons Inlet between Watsons Creek and Quail Island approximately 9 km south-west of Tooradin in one of the least accessible parts of Western Port. It is one of three MNPs that cover the Western Port Bay including the Western Port Ramsar site, the East Asian-Australasian Flyway, and the Mornington Peninsula and Western Port UNESCO Biosphere Reserve (PV 2007b). Approximately 82% of the park is intertidal with one third of the park covered by saltmarsh while mangroves make up another third and include some of the largest white mangroves

(*Avicennia marina*) remaining in Victoria (PV 2007b). This vegetation provides habitat for a variety of marine invertebrates which in turn create important feeding and roosting habitat for a variety of seabirds and shorebirds. Other conservation listed species utilise this park like the orange-bellied parrot and a variety of syngnathids. The MNP is located within Tourism Victoria's Phillip Island and Gippsland discovery product region and is only accessible by boat. Recreational opportunities exist for bird watching and boating as well as an opportunity for marine education and ecotourism. First Nations tradition indicates that the park is a part of Country of the Boonwurrung people. Artefacts and middens along the Western Port coast indicate that the Boonwurrung people have inhabited these areas for at least 6000 years and still have strong associations to the area (PV 2007b).

4.4.6.3. South Australia

South Australia has 28 MPAs which are in place to help protect and conserve marine biological diversity and habitats, natural and cultural features and allow for ecologically sustainable development. Identified state-wide pressures on the South Australian marine environment relevant to the activity include:

- Climate change including sea level rise, warming sea surface temperatures and increasing ocean acidity
- Marine pollution from wastewater and oil spills
- Resource use from mining and fishing
- Introduction and establishment of IMS (DEWNR 2012b).

Of the 28 MPAs in South Australia, 5 are intersected by the EMBA and are discussed below.

The **Lower South East Marine Park** (IUCN Category II, IV and VI) is divided into two sections and spans 360 km^2. The first section is adjacent to Canunda National Park and the second extends from Port MacDonnell Bay just west of French Point to the South Australian - Victorian border. This marine park is valued for its diverse range of habitats ranging from high-energy sandy beaches and freshwater springs, various reef types (shore platforms, fringing and limestone), kelp forests and algal communities and is strongly influenced by natural processes such as the Bonney Upwelling (DEWNR 2012a). Throughout the marine park there are many important sites for seabird and migratory shorebird species many of which are listed as threatened species and protected under international agreements. Other values associated with the marine park include recreational activities such as charter fishing, fishing competitions as well as diving and cruise ship visits. The coastline is recognised for its variety of coastal and dune formations and are among the highest ranked areas of coastal scenic quality in the State (DEWNR 2012a). Areas of the Lower South East Marine Park are traditionally associated with the Buandig First Nations people.

The **Upper South East Marine Park** (IUCN Category IV and VI) covers 906 km^2 and is divided into two sections. The first section spans from 11 km north of Tea Tree Crossing to the Maria Creek outlet at Kingston and the second extends from Wright Bay to the northern point of Stinky Bay (DEWNR 2012c). This marine park overlaps two bioregions; Coorong and Otway. The Park supports a diverse range of habitats from beaches backed by sand dunes, fringing limestone and platform reefs, dense seagrass beds and kelp forests (DEWNR 2012c). It is strongly influenced by the Bonney coast upwelling simulating the food chain and drawing a variety of species to the area. Baudin Rocks (the only island group in the Upper South East) support a breeding and haul-out site for seal species including the Australian sea lion and Australian fur seals (DEWNR 2012c). The island group is also an important roosting and breeding site for seabirds and coastal wader species. The seagrass meadows in Lacepede Bay provide an important nursery site for many fish and invertebrate species. Socio-economic values associated with the marine park include commercial fisheries, fishing competitions and other outdoor tourism activities. Two Aboriginal groups, the Ngarrindjeri and Buandig people, have traditional associations with areas of the marine park (DEWNR 2012c).

The **Southern Kangaroo Island Marine Park** (IUCN Category VI – Mining Exclusion) covers 630 km^2 and is located approximately 140 km south-west of Adelaide. Values of the marine park include the Spencer Gulf Shelf Province which creates seasonal upwellings as a result of the interaction of winds and ocean currents with seafloor features (DNP 2018b). These upwellings enhance productivity and support seasonal aggregations of a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act.

This enhanced productivity creates important foraging habitat for many seabirds, the Australian sea lion and the white shark. The SRW also utilises the marine park for breeding and nursing their young (DNP 2018b). Socio-economic values associated with the marine park include tourism, commercial and recreational fishing. The Sea Country associated with the marine park is identified to be valued and affiliated with the First Nations peoples of Kangaroo Island.

The remaining two reserves intersected by the EMBA are listed below due to limited availability of information.

- Margaret Brock Reef (IUCN Category IV) – protects 326 ha and is a specified lobster sanctuary
- Rivoli Bay (IUCN Category IV) – protects 34 ha (including islands) and is a specified lobster sanctuary.

4.4.6.4. New South Wales

In NSW marine protected areas (MPAs) are part of the NSW marine estate which covers six marine bioregions and are managed to conserve marine biodiversity and support marine science, recreation and education. The Marine Estate Management Authority (MEMA) completed an evidence-based threat and risk assessment for the NSW marine estate where priority threats to both environmental assets and social and economic benefits were assessed (MEMA 2017). The identified state-wide threats that have the potential to impact environmental, social and economic marine assets relevant to the activity include:

- Climate stressors; sea level rise, altered storm/cyclone activity, flooding, climate and sea temperature rise, altered ocean currents and nutrient inputs
- Water pollution; marine debris and toxic contaminants like antifouling paint and oil spills
- Shipping; including the physical disturbance to wildlife, the seabed and the potential of vessel strike
- Introduction and establishment of IMS
- Commercial fishing (MEMA 2017).

The NSW system includes 6 marine parks, 12 aquatic reserves and includes 20,000 ha of national parks and nature reserves (DPI 2022). Of the 18 MPAs in NSW, 2 are intersected by the EMBA and are discussed below.

Batemans Marine Park (IUCN Category II and IV) protects approximately 850 ha and extends from the most northerly point of Murramarang Beach to the southern side of Wallaga Lake entrance at Murunna Point including the offshore Tollgate Islands and Montague Island. A key feature of the Marine Park is the large expansions of rocky reef that support a diverse array of fish, invertebrates and algae (DPI 2022). Further habitat is provided by kelp beds, seagrasses, mangroves, sponge gardens, estuaries and open waters. The coastline of the Marine Park is also considered a unique environment due to the coastal lakes and lagoons which open and close intermittently to the sea (DPI 2022). The Marine Park lies within the Sea Country of the Yuin people who maintain a strong connection area.

Located within the Marine Park is Montague Island Nature Reserve, an area of high value, due to its biological importance for a variety of species. This island is a nesting site for over 8,000 little penguins, a haul-out site for Australian and New Zealand fur seals and provides breeding habitat for over 40,000 seabirds (DPI 2022).

Jervis Bay Marine Park (IUCN Category II and IV) protects approximately 215 ha and extends over 100 km of coastline from Kinghorn Point south to Sussex Inlet. The clear waters associated with the region are largely due to the joining of warm water from the East Australian Current and cooler water from the Bass Strait. Values associated with the Marine Park include the unique geology and oceanography, the relatively natural and undeveloped coastline and the mix of ecosystems, habitats, flora and fauna (DPI 2022). The region supports over 230 algae, and hundreds of marine fauna species, including several with protected status. Further, strong cultural values are associated with the Sea Country as First Nations peoples hold strong ties to the Jervis Bay area and many culturally significant First Nations sites exist within the Marine Park (DPI 2022).

4.4.7. State Protected Areas – Terrestrial

4.4.7.1. Tasmania

In Tasmania the Tasmanian Parks and Wildlife Service is responsible for managing the State's 19 National Parks, 3 World Heritage Areas (WHAs) including the Tasmanian Wilderness World Heritage Area (TWWHA), and over 800 other reserves. Areas are protected to ensure that important natural and cultural values are maintained. Identified state-wide pressures on the Tasmanian coastal environment relevant to the activity include:

- Climate change including ocean acidification and sea temperature rise
- Commercial fishing
- Marine pollution, and
- Introduction and establishment of IMS (Carr and Minshull 2020).

Significant terrestrial protected areas located within the EMBA which have a shoreline or coastal boundary are detailed below.

Southwest National Park (IUCN Category II) protects 618,300 ha and is Tasmania's largest national park covering almost 10% of the state. This Park is part of the Tasmania Wilderness World Heritage Area and protects habitats ranging from dramatic mountain ranges to rocky coastlines, deep harbours, extensive plains and vast untouched forested areas. The settlement of Melaleuca is located within the National Park and is of special significance as it is the only place in the world that the orange bellied parrot breeds (TASPAWS 2022). Further species of significance that are supported by the National Park include the short-tailed shearwater, the hooded plover and the Port Davey Skate who can be found in the Bathurst Channel (TASPAWS 2022). Visitors have the opportunity to participate in a variety of nature-based activities including fishing, caving, camping, boating, snorkelling and swimming. Further, the South Coast Track is located within the National Park and is a challenging multi-day hike across Tasmanians southern coastline. There is rich First Nations heritage within the National Park. Midden sites, artefact scatters, hut depressions and rock shelters all provide links to the people that have lived, hunted, gathered, celebrated, traded and walked this land for more than 35,000 years (TASPAWS 2022).

Arthur-Pieman Conservation Area (IUCN Category VI) protects 100,135 ha and stretches along the north-west coast of Tasmania for 85 km. The conservation area protects a range of ecosystems from the long linear coastline to a large dune system and an area that contains some of the most extensive peatlands in the southern hemisphere (TASPAWS 2002). The coast of the Arthur–Pieman Conservation Area serves as an important part of the Bass Strait migratory corridor for many bird species including the orange-bellied parrot and provides valuable breeding habitat for numerous shore birds that are threatened elsewhere in Australia (TASPAWS 2002). Visitors have the opportunity to enjoy sea-oriented activities such as fishing, boating, surfing as well as land-based activities like camping, hunting, bushwalking and birdwatching. The conservation area can be considered a First Nations landscape as many of the landforms and plant communities would have been altered, managed and maintained through past First Nations land management practices (TASPAWS 2002). The coastal zone of the conservation area contains a richness of First Nations sites and landscapes that make this area unique and important to the First Nations community.

Lungatalanana Indigenous Protected Area (IUCN Category V) protects 8,159 ha and is the third largest Furneaux Island and located to the south of Cape Barren Island. The island is known as Clarke Island and was dedicated as an Indigenous Protected area in 2009 and is managed by the Tasmanian Aboriginal Centre rangers. The protected area conserves a range of ecosystems from prominent hills and numerous wetlands to the coastal fringe dominated by sandy beaches interspersed with rocky headlands. A survey conducted in 2014 found 223 coastal marine mollusc species and 62 seabird and shorebird species, 24 of which were confirmed to be breeding on the island (Natural and Cultural Heritage Division 2014). Particular species of significance include the black-faced cormorant, Caspian tern, white-fronted tern and the hooded plover. Unfortunately, in 2014 a high intensity bushfire damaged the island damaged approximately 80 % of the island. The island is not easily accessible and as of 2009 there was only one permanent resident, instead it is mainly utilised for scientific research purposes. Further, there are many archaeological sites on the island showing a long history of First Nations occupation and land use (Natural and Cultural Heritage Division 2014).

Lavinia State Reserve (IUCN Category II) protects 7,881 ha and is on the north east side of King Island located in the Bass Strait. This State Reserve is one of the few largely unaltered areas of native vegetation that remains on King Island. The State Reserve encompasses the Lavinia Ramsar Wetland which primarily protects wetlands which are representative or rare to the bioregion. The Reserve's estuary and associated samphire mud flats, coastal swamps and lagoons provide important habitats for a range of globally threatened species such as the orange-bellied parrot and two endangered frog species (Ramsar 2014). Visitors can enjoy boating, fishing and camping in the State Reserve. Further, there are artifacts of First Nations Australian occupation on King Island that date back to the last ice age when the island was connected to Tasmania and mainland Australia via the Bassian Plain.

Strzelecki National Park (IUCN Category II) protects 4,216 ha and is located in the south-western corner of Flinders Island in Bass Strait. In addition to the main section of the National Park there is a separate coastal headland called Trousers Point that is also protected. The National Park protects a range of ecosystems from the coastline to the mountain landscape. It is of biogeographic significance as it contains elements of both Tasmanian and mainland Australian flora and fauna (TASPAWS 2000). Further there is considerable scientific interest due to the high number of endemic species, rare flora and fauna and significant vegetation communities (TASPAWS 2000). The National Park is a major attraction for visitors to Flinders Island and contributes significantly to the island's tourism sector. Visitors have the opportunity to enjoy a range of recreational activities including camping, bushwalking, nature studies and scenic driving. There is considerable evidence of First Nations occupation on Flinders Island and a number of sites have been recorded within the National Park. The majority of sites are in the form of shell middens, stone artefact scatters and cave deposits with one particular midden site located at Trousers Point (TASPAWS 2000).

Three Hummock Island State Reserve (IUCN Category II) protects 7,209 ha and is located approximately 30 km off the north west coast of Tasmanian within the Bass Strait belonging to the Hunter Island Group. The majority of the island is protected and supports a range of ecosystems including granite coastlines and sandy beaches. Species of significance which utilise the ecosystems provided by this island include the little penguin, white-bellied sea eagle and the short-tailed shearwater (Three Hummock Island 2023). The island can only be reached by air or sea and is used solely for tourism purposes with no one residing permanently on the island. Visitors have the opportunity to enjoy a range of recreational activities including bushwalking, wildlife viewing, fishing and swimming. Historically, First Nations people, specifically those of the North West Tribe, are thought to have utilised Three Hummock Island in the summer months as a hunting ground (Three Hummock Island 2023).

A collection of **Small Bass Strait Island or Rock Reserves** located north of mainland Tasmania in the Bass Strait which are protected to the low water mark. These islands or rock reserves are known to be significant breeding places for seabirds or/and seals and are often home to a significant portion of certain species global populations (DPIWE 2000). There is no current evidence of First Nations use or occupation on any of these reserves, a number of which are highlighted below:

- Albatross Island Nature Reserve (IUCN Category Ia) – is located in the Circular Head municipality and protects 21.87 ha (TASPAWS 2022b). The reserve is one of only 3 global breeding sites for the Endangered shy albatross.
- Black Pyramid Rock Nature Reserve (IUCN Category Ia) – is located in the Circular Head municipality and protects 14.47 ha (TASPAWS 2022b). The reserve is one of only 8 national breeding locations for the Australasian gannet as well as being the largest in Australia.
- Reid Rock Nature Reserve (IUCN Category Ia) – is located in the King Island municipality and protects 6.62 ha (TASPAWS 2022b). This reserve is one of only 5 Australian fur seal breeding colonies within Tasmania and the only location within the western Bass Strait (DPIWE 2000).

Additional significant protected areas intersected by the EMBA with boundaries that include the coast and/or shoreline have been identified and are listed below due to limited availability of information.

- Hunter Island Conservation Area (IUCN Category V) – protects 7,330 ha
- Sellars Lagoon Game Reserve (IUCN Category VI) – protects 7,810 ha
- Seal Rocks Conservation Area (IUCN Category V) – protects 458.07 ha
- Porky Beach Conservation Area (IUCN Category V) – protects 339.8 ha
- Cataraqui Point Conservation Area (IUCN Category V) – protects 275.79 ha
- Stokes Point Conservation Area (IUCN Category V) – protects 233.08 ha
- New Year Island Game Reserve (IUCN Category VI) – protects 118.22 ha
- Stack Island Game Reserve (IUCN Category VI) – protects 37.87 ha
- Bird Island Game Reserve (IUCN Category VI) – protects 59.05 ha
- The Doughboys (Koindrim) Nature Reserve (IUCN Category Ia) – protects 19.98 ha
- Seacrow Islet Conservation Area (IUCN Category V) – protects 4.841 ha
- Harbour Islet Conservation Area (IUCN Category V) – protects 11.35 ha
- Little Trefoil Conservation Area (IUCN Category V) – protects 2.177 ha
- Nares Rocks Conservation Area (IUCN Category V) – protects 2.743 ha
- Steep Island – managed by the Aboriginal Land Council Tasmania under the *Aboriginal Lands Act 1995 (Tas)*
- Trefoil Island – managed by the Aboriginal Land Council Tasmania under the *Aboriginal Lands Act 1995 (Tas)*
- South Black Rock – managed by the Department of Natural Resources and Environment Tasmania under the *Crown Lands Act 1976 (Tas)*
- Brown Rocks – managed by the Department of Natural Resources and Environment Tasmania under the *Crown Lands Act 1976 (Tas)*
- Delius Islet – managed by the Department of Natural Resources and Environment Tasmania under the *Crown Lands Act 1976 (Tas)*
- Henel Rock – managed by the Department of Natural Resources and Environment Tasmania under the *Crown Lands Act 1976 (Tas)*

This list was updated in response to feedback received during consultation (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 55).

4.4.7.2. Victoria

In Victoria protected areas are managed in a culturally sensitive and ecologically appropriate way by Parks Victoria, a statutory authority of the Victorian Government, who are often in partnership with Traditional Owners. A diverse estate of more than 4 million hectares including 3,000 land and marine parks and reserves making up 18% of Victoria's landmass are managed through these parties. There is a strong emphasis on enhancing environmental and cultural values and ensuring that parks are healthy and resilient for current and future generations. A variety of state-wide threats that affect all protected areas relevant to the activity include:

- Climate change effects including sea level rise, warming sea surface temperature and increasing ocean acidity
- Seabed disturbance in shallow areas
- Oil and chemical pollution, and
- Introduction and establishment of IMS (PV 2022a).

Significant terrestrial protected areas located within the EMBA which have a shoreline or coastal boundary are detailed below.

Great Otway National Park (IUCN Category II) protects 103,185 ha stretching from Torquay all the way along the Great Ocean Road to Princetown and up through the Otway's hinterland. Habitats protected by the park range from the rugged coastline with sandy inlets to some of Victoria's tallest mountain ash forests, serene fern gullies and impressive waterfalls (PV 2009). Visitors have plenty of opportunity to explore both the marine and terrestrial aspects of the National Park. Popular activities include surfing, trail walking, camping, and wildlife and wildflower viewing. Country now known as the Otways has been traditionally associated with the Gadubanud, Wathaurong, Gulidjan and Kirrae Whurrong peoples and is considered to be an essential part of their culture (PV 2009). Middens and other sites along the coast provide an extensive archaeological record of historic First Nations culture and indicate that many people lived along the Otway coastline for thousands of years.

Croajingolong National Park (IUCN Category II) protects 87,500 ha along roughly 100 km of coast from Sydenham Inlet in the west to the NSW border in the east. The National Park protects significant coastal environments of Victoria and is a significant representation of East Gippsland's diverse lowland forest and heath ecosystems and important natural catchments (PV 1996). These habitats support approximately 43 species of threatened native fauna including the little tern and the Australian fur seal. Visitors have the opportunity to enjoy a range of nature attractions like bushwalking, camping, and a variety of boat-based activities. Further the park is of major significance and importance for the conservation of Koori cultural and historical sites. There is an abundance of artefacts and middens found around the National Park which indicates a history of occupation by reasonably large populations of Koori people (PV 1996).

Wilsons Promontory National Park (IUCN Category II) protects 50,460 ha and is the oldest existing National Park in Victoria. It is located at the southernmost tip of mainland Australia and has been designated by UNESCO as a Biosphere Reserve (PV 2002). The National Park encompasses diverse vegetation communities, including warm temperate and cool temperate rainforest, tall open forests, woodlands, heathlands, and swamp and coastal communities. The variety of ecosystems allow for extreme diversity in flora and fauna. The National Park supports half of Victoria's bird species and several threatened fauna species like the white-bellied sea eagle (PV 2002). Visitors have the opportunity to enjoy its natural setting in a variety of ways, including walking, camping, sightseeing, viewing wildlife, fishing, boating and other activities. The Park receives approximately 380,000 new day visitors per year and is considered a major tourist destination in South Gippsland (PV 2002). The National Park has an early history of First Nations occupation dating back at least 6,500 years. The area is highly significant to the Gunai–Kurnai and the Boonerwrung Clans and has strong spiritual connections to both groups, who called it Yiruk and Wamoon respectively (PV 2002).

Gippsland Lakes Coastal Park Conservation Park (IUCN Category VI) protects 17,688 ha and stretches along Ninety Mile Beach from Seaspray to Lakes Entrance. It is an interconnected area of wetlands and coast and consists of the Boole Poole Peninsula, Bunga Arm and many other small islands (GLaWAC 2015). The evolution of the sand barrier system and the coastal lagoons that create the Gippsland Lakes ecosystem contribute to the value and significance of the Conservation Park. The Conservation Park encompasses the Gippsland Lakes Ramsar Site which protects internationally significant wetland ecosystems. Particular fauna species of interest include protected species like the little tern, fairy tern and the white-bellied sea-eagle (GLaWAC 2015). Visitors have the opportunity to camp and enjoy marine based activities like kayaking, boating and fishing. The Gippsland Lakes Coastal Park is jointly managed and acknowledges the fact that the Gunaikunai people hold native title and maintain a strong connection with Country.

Cape Conran Coastal Park (IUCN Category II) protects 11,000 ha and is located in far East Gippsland encompassing Point Ricardo in the west and Sydenham Inlet to the east. This coastal park features wide sandy beaches book ended by rocky outcrops. In land of the Coastal Park was once dominated by coastal bush lands which were devastated in 2020 by the bushfires (PV 2022). Species of significance that frequent the area include dolphins and seals and even whales during the migration months of May to October. Visitors have the opportunity to enjoy a variety of walking trails, camping, swimming, fishing and boating and whale watching. Cape Coran itself is one of 11 sites of Indigenous significance on the Bataluck Cultural Trail. Evidence of one of the Earth's oldest people can be found here on this shoreline, with remnants of tools and marine life that have been built up to form "shell middens" (PV 2022).

Discovery Bay Coastal Park (IUCN Category III) protects 10,460 ha and is located between Portland and Nelson adjoining the South Australian border. This remote Coastal Park protects 55 km of ocean beach and encompasses high coastal cliffs, huge rolling sand dunes and freshwater lakes and swamps inland. The beaches within the coastal park are of particular significance due to their part in the stronghold for hooded plovers in Victoria (PV 2015). Visitors have the opportunity to camp, swim, wildlife watch or even participate in the iconic Great South West Walk which is a 250 km hiking route that travels through Cobboboonee National Park, Lower Glenelg National Park and Discovery Bay Coastal Park. The land within the Coastal Park was traditionally associated with the Gunditjmara Traditional Owners (PV 2015).

French Island National Park (IUCN Category II) protects 11,100 ha and is the only National Park fully contained on an island in Victoria. This isolation has resulted in outstanding natural values. French Island is located in Western Port and has a seaward boundary out to 150 m offshore. The National Park is valued as a substantial representation of the land systems of the coastal sand plains and clayey-sand plains of Western Port and for the extensive mangrove and saltmarsh areas along the north coast (PV 1998). Further, it provides habitat for a number of internationally important migratory birds as well as the orange-bellied parrot. Visitors have the opportunity to explore the 'remote island' and participate in wildlife and wildflower viewing as well as trail walking. There have been over 30 sites of historical interest, including old salt harvesting basins on the coast, an isolated grave on Tortoise Head and an 1850s wattle and daub dwelling (PV 1998). There is further isolated evidence of First Nations use, particularly from the presence of shell middens.

4.4.7.3. South Australia

In South Australia parks and reserves are managed by National Parks and Wildlife Service South Australia (NPWSA) which provides for the establishment and management of reserves for public benefit and enjoyment and to provide for the conservation of wildlife in a natural environment (NPWSA 2023). In South Australia the protected area system consists of protected areas on public, private and Aboriginal lands and covers around 28.6% of the state (DENR 2012). Reserves represent a variety of area which may include unique land formations, cultural significance, the presence of biologically important habitat or behaviours or the presence of threatened or migratory species. Identified state-wide threats relevant to the activity include:

- Climate change
- Change in water quality; increased nutrient and sediment load, turbidity, industrial discharges
- Seabed disturbance; anchor damage, and
- Introduction and establishment of IMS (DEW 2020).

Canunda National Park (IUCN Category VI) covers 9,675 ha and is located 18 km north west of Millicent or 428 km south-east of Adelaide. The national park protects 40 km of coastline and is characterised by limestone cliffs, sea stacks, offshore reefs and low dense scrubs on the northern end and mobile sand dunes, long beaches and low foredunes on the southern end (NPWSA 2023). The national park is used for recreational activities including bushwalking, fishing, surfing, snorkelling and camping. There is evidence of use by the Boandik peoples throughout the park who regularly used the area for camping (NPWSA 2023).

Little Dip Conservation Park (IUCN Category VI) covers 2,097 ha and is located 2 km south of Robe and approximately 340 km south of Adelaide. The conservation park includes a number of small lakes and features a rugged coastline that is characterised by large sand dunes (NPWSA 2023). The conservation park is used for recreational activities including birdwatching, beachcombing, surfing and fishing. The foreshore of Lake Eliza was home to the Boandik people around 10,000 years ago, with large numbers of middens still found in the conservation park today (NPWSA 2023).

Beachport Conservation Park (IUCN Category VI) covers 881 ha and is located 50 km south of Robe and approximately 385 km south-east of Adelaide. The conservation park protects communities such as sand beaches, coastal flora and limestone cliffs (NPWSA 2023). Recreational activities in the conservation park include bird watching, camping and swimming. There is evidence of use by the Boandik peoples throughout the park in the form of middens (NPWSA 2023).

Piccaninnie Ponds Conservation Park (IUCN Category VI) covers 683 ha and is located 32 km south-east of Mount Gambier and 482 km south-east of Adelaide. The conservation park protects part of the Ramsar listed Piccaninnie Ponds Karst Wetland, valued for its underwater limestone chasms which were created through erosion as a result of the pressure from rising freshwater overtime (NPWSA 2023). The site is renowned for its diving and snorkelling with underwater visibility exceeding 40 m on occasion. Visitors can also enjoy beach and trail walks within the conservation park. The Bunganditj First Nations people are the traditional owners of this area (NPWSA 2023).

An additional significant protected area intersected by the EMBA with boundaries that include the coast and/or shoreline has been identified and is listed below due to limited availability of information.

- Nene Valley Conservation Park (IUCN Category III) – 386 ha.

4.4.7.4. New South Wales (NSW)

In NSW protected areas are set aside for conservation and managed by the NSW National Parks and Wildlife Service (NPWS) which jointly manages over 30 reserves in partnership with the traditional owners of the land. There are a variety of protected areas within NSW which include a variety of habitats and ecosystems, a diversity of plant and animal species, significant geological features and landforms, as well as First Nations cultural heritage sites, heritage buildings and historic sites. Identified state-wide threats that have the potential to impact environmental, social and economic coastal assets relevant to the activity include:

- Climate stressors; sea level rise, altered storm/cyclone activity, flooding, climate and sea temperature rise, altered ocean currents and nutrient inputs
- Water pollution; marine debris and toxic contaminants like antifouling paint and oil spills
- Shipping; including the physical disturbance to wildlife, the seabed and the potential of vessel strike
- Introduction and establishment of IMS, and
- Commercial fishing (MEMA 2017).

Significant terrestrial protected areas located within the EMBA which have a shoreline or coastal boundary are detailed below.

Nadgee Nature Reserve (IUCN Category Ib) protects 20,671 ha and runs from the south coast of NSW to East Gippsland in Victoria. The main habitats protected include the coastal range, coastal plain, estuaries, beaches, cliffs, dunes and other coastal landforms. The reserve has been relatively undisturbed since European settlement, has a large number of rare and threatened plant and animal species and has the only coastal wilderness area in NSW (NPWS 2003). Visitors have the opportunity to explore, bushwalk, birdwatch and swim within the Nature Reserve. Further, the land within the Nature Reserve is traditionally associated with Bidamal people and shared with the Dtharwa and Monaroo people. Many First Nations sites have been recorded in the reserve with evidence of historical use displayed by middens discovered along the shoreline (NPWS 2003).

Biamanga National Park (IUCN Category II) protects approximately 13,750 ha with the majority of the National Park located in land away from the high-water mark. However, it does extend to the coastal zone at Baragoot beach. The National Park conserves an important area of pristine coastal foothill environments which are home to a variety of rare and threatened plant and animal species (NPWS 2014a). Visitors have the opportunity to explore, hike, birdwatch, swim, fish and much more within the National Park. The land within the National Park was traditionally associated with the Yuin people and in 2006 it was returned to its traditional custodians and is now part of a joint management agreement with NSW National Parks (NPWS 2014a). Many First Nations sites within the reserve have spiritual significance for the Yuin people.

Murramarang National Park (IUCN Category II) protects 12,100 ha and spans 44 km of coastline between Bawley Point-Kioloa area and Batemans Bay and is associated with the offshore Belowla Island and Tollgate Islands Nature Reserves (NPWS 2002). The Park contains the largest sample of spotted gum reserved under the National Parks and Wildlife Act and is considered a unique environment as it is unusual to find spotted gum and temperate rainforest so close to the sea (NPWS 2002). Further, the offshore islands are considered to be of significant value as sea-bird nesting habitat. In the past the National Park has had a high use of recreational activities which has resulted in damaged vegetation and erosion. The current management plan aims to address this damage and protect the attractions that are popular with visitors. There continue to be a variety of recreational facilities for visitors to enjoy. Typical activities include camping, bushwalking, swimming, snorkelling and cultural educational experiences. Historically this land was of economic importance due to the ease of access to food resources, medicines and shelter provided by both the sea and land (NPWS 2002). There have been more than 30 First Nations sites identified within the National Park, most of which are shell middens which have been keep in good condition.

Beowa National Park, formerly Ben Boyd National Park, (IUCN Category II) protects 10,500 ha and spans 47 km of rocky coastline and sheltered inlets The National Park is located near Eden and split by Twofold Bay into two separate areas (NPWS 2021). Unique features of the park include the striking contrast between the folded red rock platforms and the sapphire blue water of the ocean. Species of significance known to visit the ocean surrounding the National Park include the SRW and the humpback whale (NPWS 2021). Visitors have the opportunity to bushwalk, swim and snorkel in the sheltered inlets, visit the historic Green Cape light station and whale watch. There have been more than 50 First Nations sites have recorded in the National Park including middens, rock shelters, campsites and long-distance travel routes (NPWS 2021).

Bournda Nature Reserve (IUCN Category la) protects 6,088 ha and is located on the far south coast between Tathra and Merimbula. The coastline of the Nature Reserve is particularly impressive and features beaches, cliffs, rocky bays and deep clefts (NPWS 2014b). Estuarine wetlands included in the reserve provide important roosting and feeding areas for a large variety of waders and waterfowl including threatened species like the little tern and hooded plover (NPWS 2014b). Bournda has an important tourism, recreational and educational role in the district and provides various opportunities for water-based recreation which attracts a large number of visitors to the park. The land within the Nature Reserve was traditionally associated with the Dhurga and Yuin people. First Nations heritage and historical use is apparent throughout the Nature Reserve and provides a valuable opportunity for understanding historical use of the area (NPWS 2014b).

Mimosa Rocks National Park (IUCN Category II) protects 5,700 ha and is located near Belga on the far south coast of NSW. The dunes and cliffs associated with the National Park contain specialised species that can withstand winds and salty air like the coastal banksia, coast wattle and drooping she-oak (NPWS 2022). Species of significance supported by the vegetation include the hooded plover, the bar-tailed godwit and a variety of migratory birds which nest on the coastline (NPWS 2022). The National Park is named after Paddle Steamer Mimosa that wrecked in 1863 after running onto rocks at the northern end of the park (NPWS 2022). Visitors have the opportunity to swim, snorkel, and surf within the coastal waters while on land there are campgrounds, trails and a variety of historic sites to explore. The land within the Nature Reserve was traditionally associated with the Yuin people who utilised the proximity of shelter and medicine provided by the land to the food resources provided by the sea.

Further, there is one state protected terrestrial park in Jervis Bay Territory that is within the EMBA and has boundaries that include the coast and/or shoreline.

Booderee National Park (IUCN Category II) protects 6,312 ha of Jervis Bay on the south coast of NSW and is managed by Parks Australia alongside the land’s traditional owners. The National Park includes 875 ha of marine environment and is home to Australia’s only Aboriginal-owned and managed Botanic Gardens which includes another 80 ha (DCCEEW 2021c). The National Park protects marine environments that include hallow rock reefs and sand zones, seagrass meadows, deeper silty sand flats and deep-water rocky reefs, cliffs, platforms, blocks, boulders and caves. Further, it supports the largest *Posidonia* seagrass meadows in NSW, is home to a population of bottlenose dolphins and used by SRW and humpback whales in their northerly migration (DCCEEW 2021c). Visitors have the opportunity to enjoy a variety of marine and land-based activities such as snorkelling, swimming, whale watching, trail walking and camping. The land within the National Park was traditionally associated with the Koori people and Booderee is owned by the Wrecks Bay First Nations community.

4.4.8. Threatened Ecological Communities

Threatened Ecological Communities (TECs) are protected as Matters of National Environmental Significance (MNES) under Part 13, Section 181 of the EPBC Act and provide wildlife corridors and/or habitat refuges for many plant and animal species. Listing a TEC provides a form of landscape or systems-level conservation (including threatened species). There are 23 TECs identified within the EMBA:

- Alpine sphagnum bogs and associated fens
- Araluen scrap grassy forest
- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community
- Brogo vine forest of the south east corner bioregion
- Coastal swamp oak (Casuarina glauca) forest of New South Wales and south east Queensland ecological community
- Coastal swamp sclerophyll forest of New South Wales and south east Queensland
- Giant kelp marine forests of south east Australia
- Gippsland red gum (*Eucalyptus tereticornis subsp. mediana*) grassy woodland and associated native grassland
- Grassy eucalypt woodland of the Victorian volcanic plain
- Illawarra and south coast lowland forest and woodland ecological community
- Illawarra-Shoalhaven subtropical rainforest of the Sydney basin bioregion
- Karst springs and associate alkaline fens of the Naracoorte coastal plain bioregion
- Littoral rainforest and coastal vine thickets of eastern Australia
- Lowland grassy woodland in the south east corner bioregion
- Lowland native grasslands of Tasmania
- Natural damp grassland of the Victorian coastal plains
- Natural temperate grassland of the south eastern highlands
- Natural temperate grassland of the Victorian volcanic plain
- Seasonal herbaceous wetlands (freshwater) of the temperate lowland plains
- Subtropical and temperate coastal saltmarsh
- Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata / E. brookeriana*)
- Tasmanian white gum (*Eucalyptus viminalis*) wet forest
- White box-yellow box-blakely's red gum grassy woodland and derived native grassland.

Of the TECs listed above, only 5 have marine or coastal features while the rest are located above the high-water mark. Those with marine or coastal features are detailed below and displayed in Figure 4-13.

4.4.8.1. Assemblages of species associated with Open-Coast Salt-Wedge Estuaries of Western and Central Victoria Ecological Community

This ecological community is an assemblage of native plants, animals and micro-organisms associated with the dynamic salt-wedge estuary systems that occur within the temperate climate, microtidal regime (< 2 m), high wave energy coastline of western and central Victoria. The TEC currently encompasses 25 estuaries greater than 1 km in the region defined by the border between South Australia and Victoria and the most southerly point of Wilsons Promontory (TSSC 2018). Typically, these estuaries are drowned river valleys that are relatively shallow and linear. This ecological community spans a unique geographical and climatic region defined by the overlap of the Flindersian and Maugean marine biogeographical provinces which have a distinctive east to west pattern of turnover for many marine taxonomic groups (TSSC 2018).

4.4.8.2. Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland Ecological Community

This ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, in Queensland to Bermagui in southern NSW in coastal catchments, mostly at elevations less than 20 m above sea-level and typically within 30 km of the coast (TSSC 2018b). Typically, coastal swamp oak forest is found in association with other vegetation types such as coastal saltmarsh, mangroves, freshwater wetlands, littoral rainforests or swamp sclerophyll forests in a 'mosaic' of coastal floodplain communities (TSSC 2018b). When ground water is more saline, like estuarine or coastal lake fringes, the ecological community is typically expressed as a low woodland or forest and the composition of the understory is likely to include saline tolerant (typically saltmarsh) species (TSSC 2018b). Further, the vegetation of these communities provide a diverse habitat for a wide range of fauna, many of which are listed as threatened under government legislations.

4.4.8.3. Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland

This ecological community is located between the Great Dividing Range and the coastline from Gladstone Qld, through to the south coast of NSW. The community includes any organisms typically associated with forested palustrine wetlands or swamp forests, found in the temperate to subtropical coastal valleys of Australia's east coast and islands. It most commonly occurs within 20 km of the coast at elevations below 20 m above sea-level (DAWE 2021b). Vegetation in the wetland system is governed by the hydrologic regime. Further, the coastal swamp sclerophyll forest can be found in, or as part of, nationally and internationally important wetlands. Notable species typically associated with these communities include waterbirds such as the Australian painted snipe, migratory waders like the great knot and the nationally listed green and golden frog (DAWE 2021b). Currently there is no spatial data available for this TEC, therefore its extent is not displayed in Figure 4-13.

4.4.8.4. Giant Kelp Marine Forests of South East Australia

Giant kelp (*Macrocystis pyrifera*) is large brown algae that grows on rocky reefs from the sea floor 8 m below sea level and deeper and is the foundation species of this TEC in shallow coastal marine ecological communities. Its fronds grow vertically toward the water surface, in cold temperate waters off south-east Australia. The kelp species itself is not protected, rather, it is communities of closed or semi-closed giant kelp canopy at or below the sea surface that are protected (DSEWPaC 2012c).

During community information sessions it was identified that there was some confusion regarding mapping for the Giant Kelp Marine Forests of South East Australia threatened ecological community, versus the presence/absence of kelp in the region (Document ID: 3923). ConocoPhillips Australia undertook to provide clarification that the data source and map visualisation was specific to the threatened ecological community in which *macorcystis pyrifera* is the foundation species and requested additional information to improve the assessment and mapping of kelp more generally near King Island.

Giant kelp is the largest and fastest growing marine plant. Its presence on a rocky reef adds vertical structure to the marine environment that creates significant habitat for marine fauna, increasing local marine biodiversity. Species known to shelter within the kelp forests include weedy sea dragons (*Phyllopteryx taeniolatus*), six-spined leather jacket (*Mesuchenia freycineti*), brittle star (*Ophiuroid spp*), urchins, sponges, blacklip abalone (*Tosia spp*) and southern rock lobster (*Jasus edwardsii*). The large biomass and productivity of the giant kelp plants also provide a range of ecosystem services to the coastal environment (DSEWPaC 2012c).

Giant kelp requires clear, shallow water no deeper than approximately 35 m (DSEWPaC 2012c). They are photo-autotrophic organisms that depend on photosynthetic capacity to supply the necessary organic materials and energy for growth. O'Hara (in Andrew 1999) reported that giant kelp communities in Tasmanian coastal waters occur at depths of 5 to 25 m. The largest extent of the ecological community is in Tasmanian coastal waters from Eddystone Point in the north-east of Tasmania along the eastern coastline to Port Davey. It is also known to develop intermittently on the northern and western coasts of Tasmania (DSEWPaC 2012c).

The listing advice for the TEC identifies that in Tasmania, patches of the TEC are predominantly found in sheltered embayments associated with rocky reefs on the south and east coasts. Patches are rare on the west and northern coasts but do occur in sheltered areas where substrata and water conditions are favourable for growth (DSEWPaC 2012c).

4.4.8.5. Subtropical and Temperate Coastal Saltmarsh

Subtropical and temperate coastal saltmarshes occur in a relatively narrow strip along the Australian coast, within the boundary along 23°37’ latitude along the east coast and south from Shark Bay on the west coast of WA (TSSC 2013). The community is found in coastal areas which have an intermittent or regular tidal influence.

The coastal saltmarsh community consists mainly of salt-tolerant vegetation including grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate, and vegetation is generally less than 0.5 m in height (Adam 1990). In Australia, the vascular saltmarsh flora may include many species, but is dominated by relatively few families, with a high level of endism at the species level. Communities are inhabited by a wide range of infaunal and epifaunal invertebrates and low and high tide visitors such as fish, birds and prawns (Adam 1990). It is often important nursery habitat for fish and prawn species. Insects are also abundant and provide an important food source for other fauna. The dominant marine residents are benthic invertebrates, including molluscs and crabs (Ross et al. 2009).

The coastal saltmarsh community provides extensive ecosystem services such as the filtering of surface water, coastal productivity and the provision of food and nutrients for a wide range of adjacent marine and estuarine communities and stabilising the coastline and providing a buffer from waves and storms. Most importantly, the saltmarshes are one of the most efficient ecosystems globally in sequestering carbon, due to the biogeochemical conditions in the tidal wetlands being conducive to long-term carbon retention.

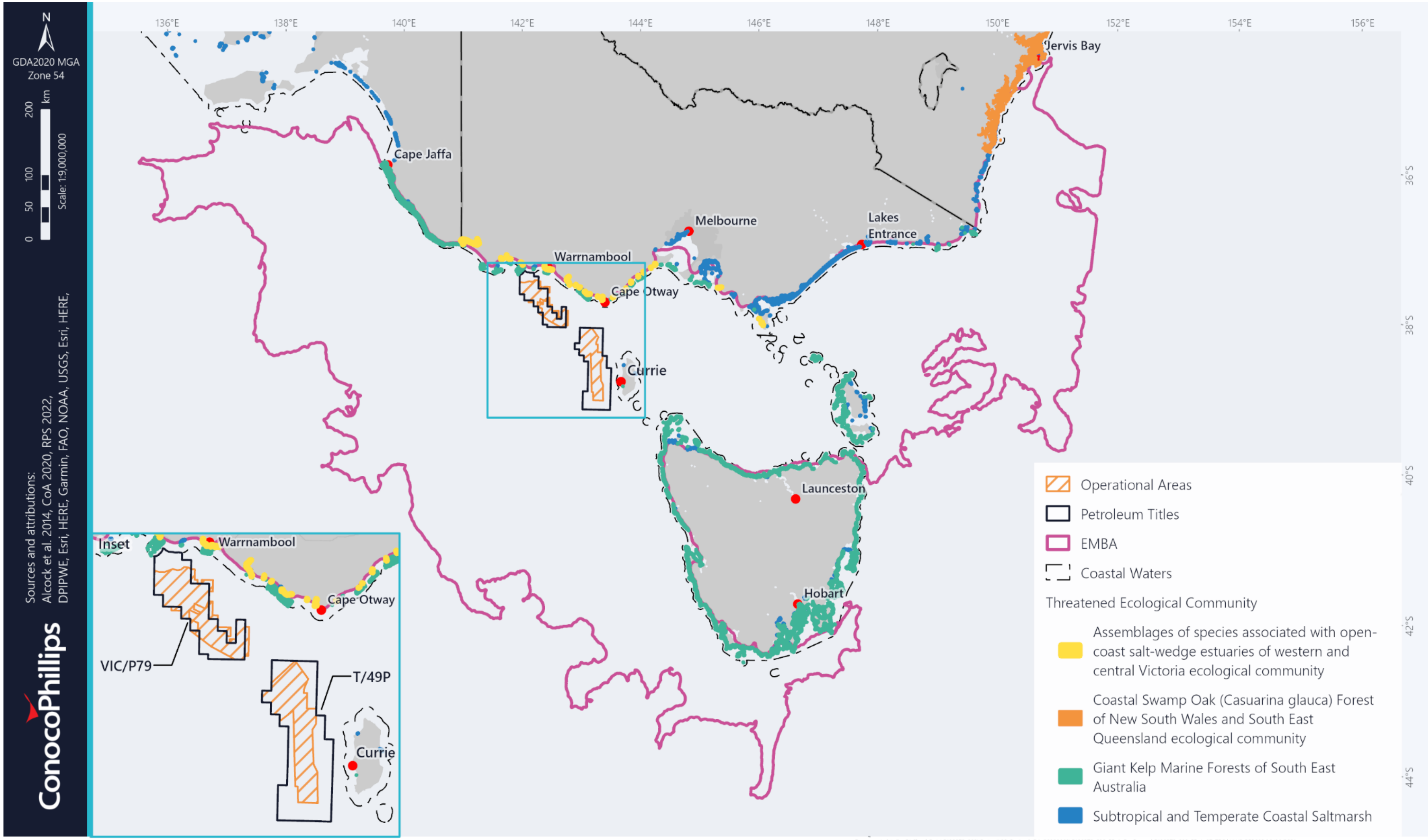


Figure 4-13: Threatened Ecological Communities within the EMBA

4.4.9. Key Ecological Features

Key Ecological Features (KEFs) are elements of the Commonwealth marine environment that, based on current scientific understanding, are considered to be of regional importance for either the region's biodiversity or ecosystem function and integrity. KEFs have no legal status in decision-making under the EPBC Act but may be considered as part of the Commonwealth marine area. There are 9 KEFs that overlap the EMBA which are detailed below and displayed in Figure 4-14.

4.4.9.1. Bonney Coast Upwelling

The Bonney coast upwelling is a seasonal upwelling that brings cold nutrient rich water to the sea surface and supports regionally high productivity and high species diversity in an area where such sites are rare and typically of smaller scale (DCCEEW 2015a). The Bonney coast upwelling is overlapped by the EMBA (Figure 4-14) and is located on the continental shelf, approximately 120 km north-west of Cape Jaffa, SA to Portland, Victoria. Originally its location was derived through a review of enhanced chlorophyll occurrence for summer seasonal data between the years of 1998 and 2010 (Research Data Australia 2013). The Bonney coast upwelling is defined as a KEF as it is an area of enhanced pelagic productivity which causes high aggregations of marine life to occur (DCCEEW 2015a).

The primary ecological importance of the Bonney coast upwelling is as one of 12 widely recognised feeding areas for the pygmy blue whale (PBW). The upwelled nutrient-rich re-heated Antarctic intermediate water promotes blooms of coastal krill (*Nyctiphanes australis*) which in turn attract PBW to the region to feed. This upwelling is one of only two identified seasonal feeding areas for PBW in Australian coastal waters and is one of 12 known blue whale feeding aggregation areas globally. Sightings of other species – namely the sei whale (Gill et al. 2015), and the fin whale (Morrice et al. 2004), indicate this is potentially also an important feeding ground for other species. In addition to whales, many endangered and listed species frequent the area, possibly also relying on the abundance of krill that provide a food source to many seabirds and fish. The high productivity of the Bonney coast upwelling KEF is also capitalised on by other higher predator species such as little penguins and Australian fur seals which utilise the area for foraging and to feed on baitfish (DCCEEW 2015a).

The upwelling phenomenon generally starts in the eastern part of the Great Australian Bight in November/December and spreads eastwards to the Otway Basin around February (Gill et al. 2011) as the latitudinal high-pressure belt migrates southward. The upwelling occurs via Ekman dynamics, where the ocean surface experiences a steady wind stress which results in a net transport of water at right angles to the left of the wind direction.

4.4.9.2. West Tasmania Canyons

The West Tasmania canyons is the greatest density of canyons within Australian waters where 72 submarine canyons have incised a 500 km-long section of slope (Heap and Harris, 2009). This KEF is located on the relatively narrow and steep continental slope west of Tasmania within the EMBA (Figure 4-14). The West Tasmania canyons are defined as a KEF as they are able to influence currents, act as sinks for rich organic sediments and debris, and trap waters or create upwellings that result in productivity and biodiversity hotspots (DCCEEW 2015a). Submarine canyons modify local circulation patterns by interrupting, accelerating, or redirecting current flows that are generally parallel with depth contours. Their size, complexity and configuration of features determine the degree to which the currents are modified and therefore their influences on local nutrients, prey, dispersal of eggs, larvae and juveniles and benthic diversity with subsequent effects which extend up the food chain (DCCEEW 2015a). Sponges are concentrated near the canyon heads, with the greatest diversity between 200 m and 350 m water depths. Sponges are associated with abundance of fishes and the canyons support a diversity of sponges comparable to that of seamounts (DCCEEW 2015a). Based upon this enhanced productivity, the West Tasmania canyon system includes fish nurseries (blue warehou and ocean perch), foraging seabirds (albatross and petrels), white shark and foraging blue and humpback whales.

Eight submarine canyons surveyed in Tasmania displayed depth-related patterns with regard to benthic fauna, in which the percentage occurrence of faunal coverage visible in underwater video peaked at 200- 300 m water depth, with averages of over 40% faunal coverage. Coverage was reduced to less than 10% below 400 m depth. Species present consisted of low-relief bryozoan thicket and diverse sponge communities containing rare but small species in water depths of 150 m to 300 m.

A section of the canyons are covered by the Zeehan AMP and are relatively small on a regional basis, each less than 2.5 km wide, covering an average area of 34 km^2 and are shallower than 1,500 m. The Zeehan canyons are typically gently sloping and mud-filled with less exposed rocky bottoms compared with other canyons in the south-east marine region (e.g. Big horseshoe canyon).

4.4.9.3. Big Horseshoe Canyon

Big horseshoe canyon lies south of the coast of eastern Victoria and is the easternmost arm of the Bass canyon system (Figure 4-14). The steep, rocky slopes provide hard substrate habitat for attached large megafauna. Big horseshoe canyon is defined as a KEF as it is an area of high productivity and aggregations of marine life (DCCEEW 2015a). Canyons have a marked influence on diversity and abundance of species through their combined effects of topography, geology and localised currents, all of which act to funnel nutrients and sediments into the canyon. Sponges and other habitat forming species provide structural refuges for benthic fish, including the commercially important pink ling (*Genypterus blacodes*) and the only known temperate location of the stalked crinoid (*Metacrinus cyaneu*), which occurs in water depths between 200 m and 300 m (DCCEEW 2015a).

4.4.9.4. Upwelling East of Eden

The upwelling east of Eden is defined as a KEF due to its high productivity and aggregations of marine life (Figure 4-14). The upwelling is influenced by dynamic eddies of the east Australian current which cause episodic productivity events when they interact with the continental shelf and headlands. The episodic mixing and nutrient enrichment events drive phytoplankton blooms that are the basis of productive food chains including zooplankton, copepods, krill and small pelagic fish (DCCEEW 2015a). The upwelling of this region on the eastern Victorian coast and southern NSW coast occurs more or less continuously from austral spring to autumn (Huang and Wang 2019). However, there is strong temporal (i.e., month to month, seasonal and inter-annual) variability of the upwelling characteristics and area of influence (Huang and Wang 2019).

The upwelling supports regionally high primary productivity which in turn support fisheries and biodiversity, including top order predators, marine mammals and seabirds. This area is one of two feeding areas for blue whales and humpback whales, known to arrive when significant krill aggregations form. The area is also important for other cetaceans, seals, sharks and seabirds (DCCEEW 2015a)

4.4.9.5. Canyons on the Eastern Continental Slope

The canyons on the eastern continental slope are defined as a KEF as they provide a unique seafloor feature with enhanced ecological functioning, integrity and biodiversity, which apply to both its benthic and pelagic habitats (Figure 4-14). These canyons affect the water column by interrupting the flow of water across the seafloor and creating turbulent conditions. This turbulence transports bottom waters to the surface, creating localised upwellings of cold, nutrient-rich waters, which result in regions of enhanced biological productivity relative to the surrounding waters (Prince 2001). This increase in food abundance and availability is an attractant for species of higher trophic level such as tuna and seabirds, and results in aggregation areas and regions of high biodiversity (Brewer et al. 2007). During winter, a decrease in water temperature can change water-mass densities, creating regions of downwelling. Although generally associated with low nutrient regimes, in this context these events are thought to play an important role in breaking down shelf-edge fronts, displacing deeper oceanic slope water and consequently pushing relatively nutrient-rich water towards the photic zone (Prince 2001).

4.4.9.6. Seamounts South and East of Tasmania

The seamounts south and east of Tasmania are defined as a KEF as they are considered an area of high productivity which results in increased aggregations of marine life and increasing biodiversity. They are a cluster of seamounts rising from the abyssal plain, continental rise or plateau situated 200 km or more from Tasmanian shore EMBA (Figure 4-14) (DCCEEW 2015a). Seamounts geological features provide variable habitat for species. Some summits and slopes will have hard substrate which can provide attachment points for sessile invertebrates, while others will be soft sediment and can be habitat for species that burrow (DCCEEW 2015a). Further, seamounts can sometimes influence and intensify currents, creating localised upwelling and turbulent mixing. Accelerated water flows are thought to create upwellings of nutrient rich waters from the seafloor (DCCEEW 2015a).

4.4.9.7. Shelf Rocky Reefs

The shelf rocky reefs habitat has been defined as a KEF as it is considered a unique sea-floor feature associated with ecological properties of regional significance (Figure 4-14). This feature supports a range of complex benthic habitats and an overlap of both temperate and tropical species whose distribution is strongly influenced by the East Australia Current (DCCEEW 2015a). Along the continental shelf, benthic communities on rock outcrops and boulder substrates shift from algae-dominated communities to those dominated by attached invertebrates with species richness and density generally increasing with depth along the NSW coast (DCCEEW 2015a).

4.4.9.8. Kangaroo Island Pool, canyons and adjacent shelf break, and Eyre Peninsula upwellings

The Kangaroo Island pool, canyons and adjacent shelf break, and Eyre Peninsula upwellings has been defined as a KEF as the area is considered to support high productivity and aggregations of marine life (Figure 4-14). The Kangaroo Island canyons are a small group of steep, narrow canyons which begin at the eastern end of the Ceduna Terrace and continue to the Murray canyons (DCCEEW 2015a). The primary and secondary production within this area is considered to be high for Australian waters in the south-west marine region. During the summer and autumn months the Flinders Current supplies an upwelling of cold nutrient-rich water which support high plankton production and in turn attracts species to the area to forage. Further, the shelf break adjacent to the canyons is known for high yields of giant crab and southern rock lobster (DCCEEW 2015a).

4.4.9.9. Ancient Coastline at 90-120 m depth

The ancient coastline at 90-120 m depth has been defined as a KEF for its ability to create high productivity which supports aggregations of marine life, biodiversity and endemism (Figure 4-14). The gradual increase in sea level over time is reflected across the continental shelf of the South-west Marine Region by several terraces and steps. A prominent escarpment occurs close to the middle of the continental shelf off the Great Australian Bight at a depth of approximately 90–120 m (DCCEEW 2015a). These prominent escarpments create complexity in the topography which can facilitate localised upwellings due to a shift in water movements and in turn increase benthic biodiversity. At these locations the seafloor is dominated by sponge communities. The ancient coastline is thought to provide ecological connectivity for demersal fish species travelling across the continental shelf (DCCEEW 2015a).

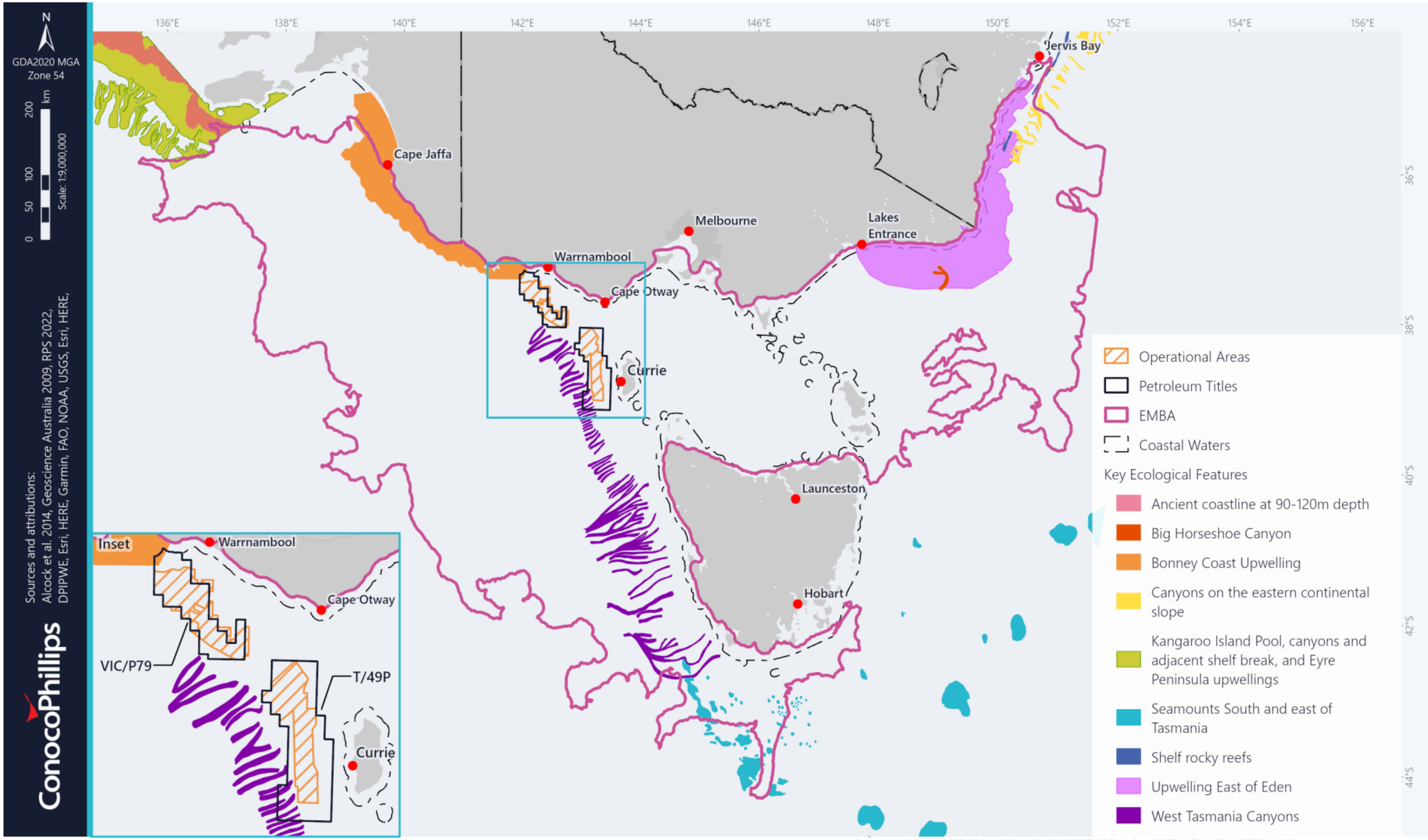


Figure 4-14: Key Ecological Features within the EMBA

4.5. Physical Environment

4.5.1. Air Quality

The Kennaook / Cape Grim Baseline Air Pollution Station is located on the north-west tip (Woolnorth Point) of Tasmania and analyses the composition of air samples to determine concentrations of greenhouse and ozone-depleting gases and other air pollutants (CSIRO 2022a). Air masses between 190°S - 280°W arrive at the station, typically having travelled for thousands of kilometres across the Southern Ocean. There are no intervening land masses which allows the air to be free from recent human and terrestrial influences and allows samples to be representative of a 'baseline' atmospheric composition for the mid-latitudes of the Southern Hemisphere (CSIRO 2022a). The most recent report completed by the CSIRO in September 2022 showed the levels greenhouse gas levels at Cape Grim to be 415.3 ppm carbon dioxide (CO_2), 1877.2 ppb methane (CH_4) and 335 ppb nitrous oxide (N_2O). This location, 111 km from the T/49P operational area, is thought to be one of the cleanest air sources in the world. Therefore, even considering the effects of other historical and existing offshore marine activities (including oil and gas developments, fisheries and shipping) the air quality in the EMBA is expected to be high.

4.5.2. Climate

The climate of the South-east Marine Region is temperate with cool, wet winters and warm dry summers (IMCRA 1998). The area has a mean maximum temperature of 21.3°C (February) and a mean minimum temperature of 7.6°C (July) (BoM 2018). Historical (1995 – 2022) average air temperatures recorded at King Island airport range from 10°C to 17°C (BoM 2022). The annual average rainfall is 858 mm with the predominant rainfall falling between May and October (BoM 2022). Lower mean monthly rainfall totals of are expected during September and October.

The Bass Strait is located on the northern edge of the westerly wind belt known as the ’Roaring Forties’. In winter, when the subtropical ridge moves northwards over the Australian continent, cold fronts generally create sustained west to south-westerly winds and frequent rainfall in the region (McInnes and Hubbert 2003). In summer, frontal systems are often shallower and occur between two ridges of high pressure, bringing more variable winds and rainfall. Occasionally, intense mesoscale low-pressure systems occur in the region, bringing very strong winds, heavy rain, and high seas. These events are unpredictable in occurrence, intensity, and behaviour, but are most common between September and February (McInnes and Hubbert 2003).

RPS (2020) acquired high-resolution wind data from 2009 to 2017 (inclusive) across their modelling domain from the National Centre for Environmental Prediction (NCEP) Climate Forecast System Reanalysis (CFSR). Table 4-2 lists the monthly average and maximum winds derived from the CFSR station in the region. RPS conducted a Metocean study for locations expected to receive the most extreme conditions within both T/49P and VIC/P79, producing monthly wind rose distributions from modelled datasets from 1979 to 2021 (inclusive) as in Figure 4-15 and Figure 4-16. The wind roses clearly indicate the dominance of westerly winds for most of the year with the windiest months from June to September (RPS 2022).

Table 4-2: Predicted average and maximum wind speeds for the representative wind station in the Bass Strait

Month	**Average wind speed (knots)**	**Maximum** wind speed (knots)	**General direction (from)**
January	15	43	South-west
February	15	46	South-southwest and East-northeast
March	15	41	West-southwest and north-east
April	15	49	West (variable)
May	17	50	West (variable)
June	18	46	West (variable)
July	19	45	West-northwest
August	20	47	West-northwest
September	18	50	West
October	17	45	West
November	15	39	West

Month	**Average wind speed (knots)**	**Maximum** wind speed (knots)	**General direction (from)**
December	15	41	West
Minimum	15	39	
Maximum	20	50	

Source: RPS (2020).

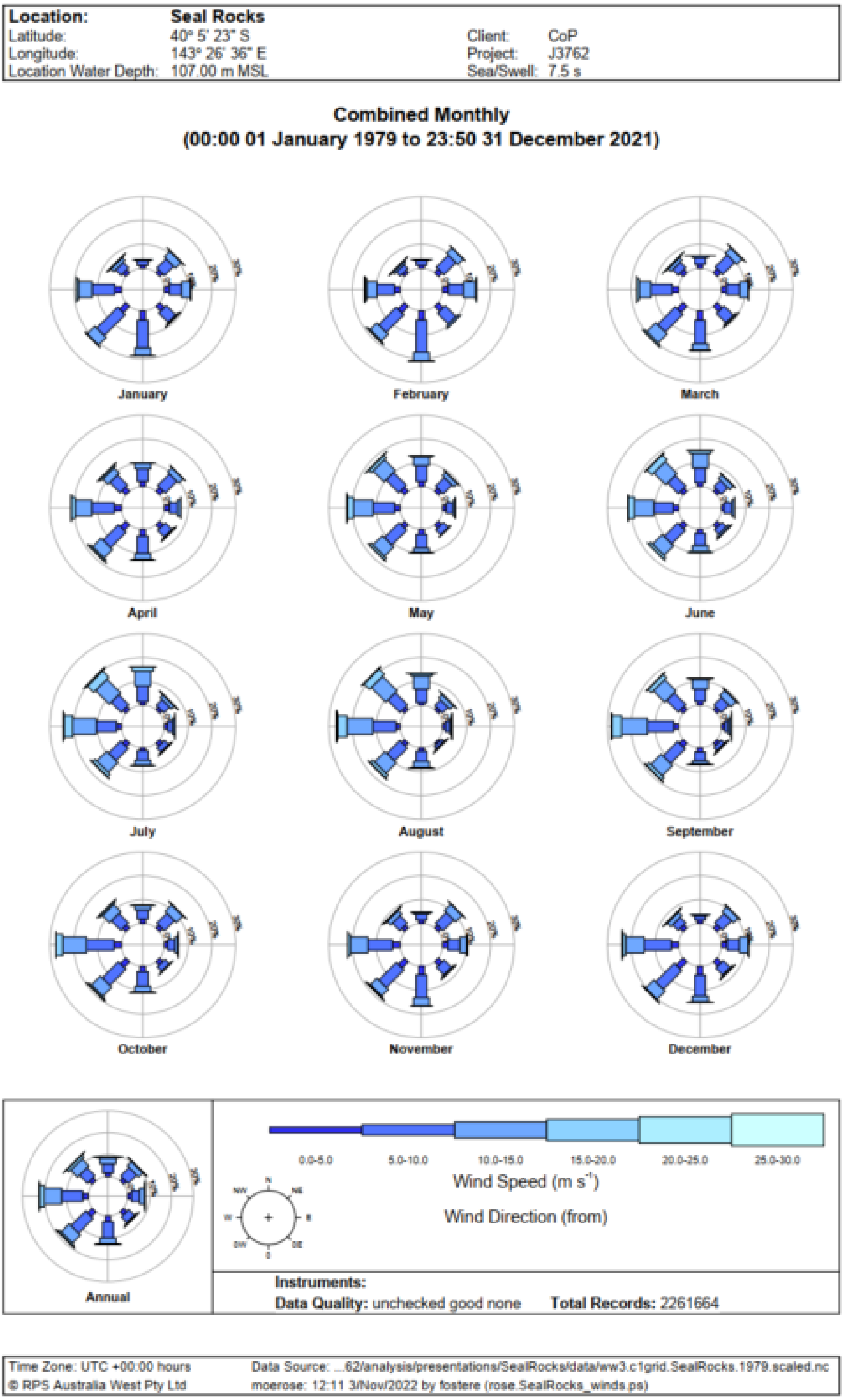


Figure 4-15: Monthly wind rose distributions from 1979-2021 (inclusive) for modelled location within T/49P

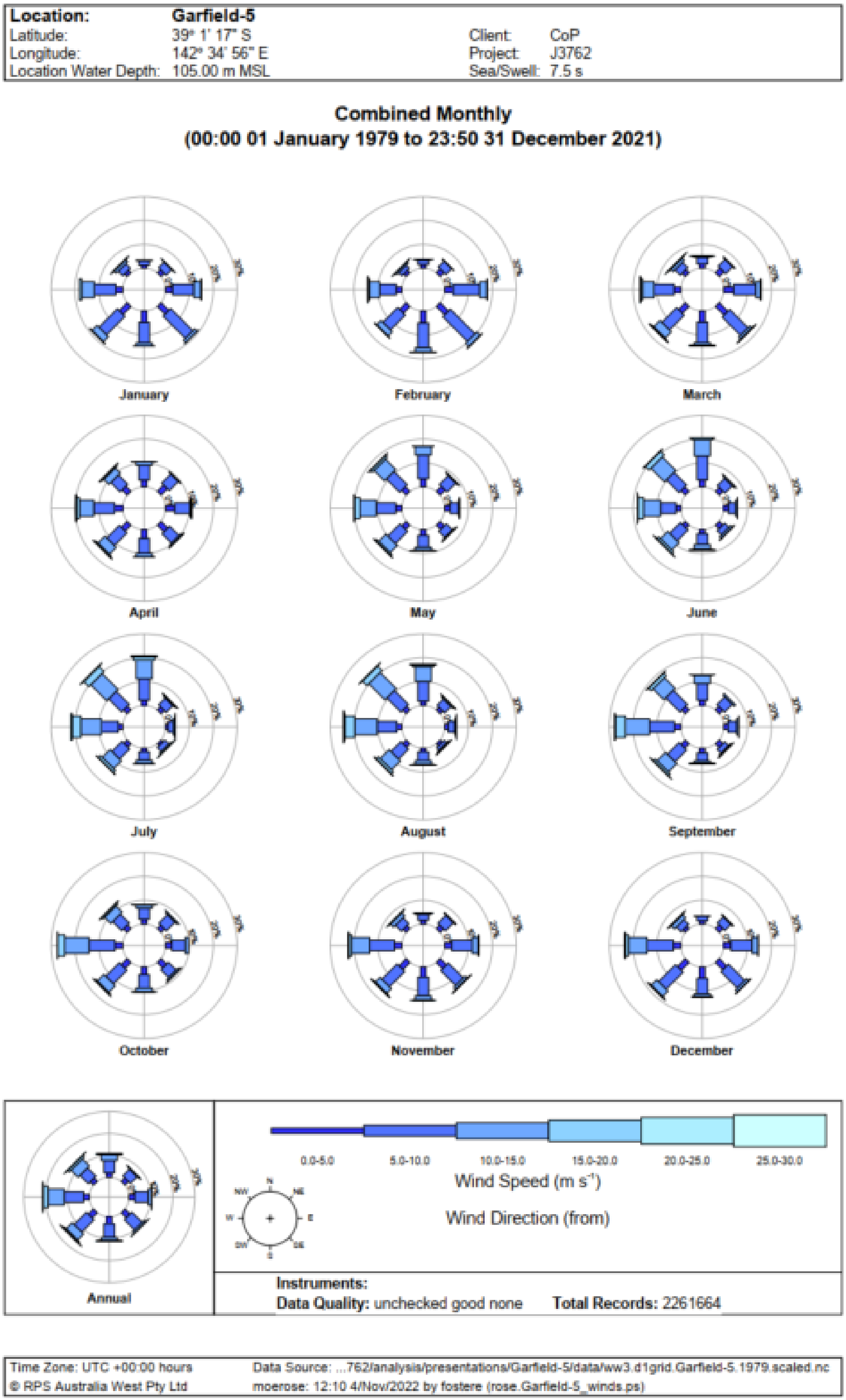


Figure 4-16: Monthly wind rose distributions from 1979-2021 (inclusive) for modelled location within VIC/P79

4.5.3. Water Quality

The Bass Strait is an area of shallow continental shelf between Victoria and Tasmania connecting the south-east Indian Ocean with the Tasman Sea (Sandery and Kampf 2005). In the winter and to a large degree in spring, waters are well mixed with little to no apparent stratification while the central region becomes stratified in summer. Lateral flushing results from inflows of three primary water masses; South Australian Current Water, East Australian Current Water and sub-Antarctic Surface Water. Contributions from the primary water mass have an influence on local marine ecosystems owing to their different nutrient contents (Sandery and Kampf 2005). The nutrient concentrations in Central Bass Strait are low compared to its extremities (Gibbs et al. 1986; Gibbs 1992). It is hypothesised that this could be due to the biological demands of the Bass Strait waters consuming much of the nutrients before moving into Central Bass Strait (Gibbs 1992).

In nearshore areas, water quality may be negatively affected through the discharge of polluted waters from rivers, which drain catchments dominated by stock grazing and small coastal settlements (PV 2006).

4.5.4. Metocean Conditions

4.5.4.1. Tides and Water Levels

Astronomical tides result from forces exerted by the sun and moon. The astronomical tides of the Otway Basin have been observed at a number of widely spaced coastal stations and at only a few offshore stations. Existing work and published literature show that the tides for the region are slightly mixed but predominantly semidiurnal (typically two highs and two lows per day) with a significant diurnal inequality (difference in heights of successive highs and successive lows) (RPS 2023). The tides in the Otway Basin study area are very small with a maximum spring range of only approximately 0.65 m and similarly, lowest astronomical tide (LAT) is only approximately 0.70 m below mean sea level (MSL).

The most important variation in sea-level is that due to the astronomical tides, however, there are other phenomena which may be of relevance to offshore operations. Meteorological effects will cause variations of possibly 0.2 m on a time scale of 5 to 9 days and possibly 0.2 m over a period of one or two months, while the seasonal variation over a year is likely of the order of only 0.1 m.

4.5.4.2. Current Regime

Current mechanisms in the eastern Great Australian Bight (GAB), Otway Basin and western Bass Strait region, as described below, are based upon published literature review and previous analysis of both measured and modelled current data sets (RPS 2022).

Ocean currents affecting the VIC/P79 and T/49P operational areas are driven by a number of forces. These include astronomical tidal forcing, surface wind forcing, regional drift current forcing and pressure (density) forcing due to variations in seawater density.

On the shallower continental shelf region (which extends out to a water depth of about 200 m at the shelf edge) and in the deeper continental slope area (200 to 4500 m water depths), wind-driven and regional drift current flows will predominate throughout the year, especially in the upper portions of the water columns. The low pressure systems/extratropical cyclones, predominantly those of the winter months will generate the strongest wind-driven currents. However, the main effects of the wind-driven currents will be confined to the near surface/upper layers where they will typically be the dominant mechanism.

A regional drift current flows in a general west to east direction along the continental shelf, as a continuation of the Leeuwin Current which flows southward along the Western Australian coast, then turns east and flows eastwards across the GAB and Otway Basin before passing off the west coast of Tasmania (Figure 4-17). The driving mechanism of this current is not well understood in this area, but it is strongest in the region of the shelf break (approximately 200 m depth contour) where the continental shelf meets the slope. This drift current (due to the regional circulation) flows mostly east-south-easterly over the Otway Basin operational areas, corresponding to the local orientation of the continental shelf break. It is known that this current is most present in autumn and in winter (April – August), but there are suggestions it may occur outside this time (i.e. in all months), however measured data is inconclusive.

Maximum total steady near-surface currents will likely occur when the storm or wind-driven currents act in line with the regional drift current. As a result, the most extreme upper-level currents are more likely to flow towards the east-southeast, especially in winter.

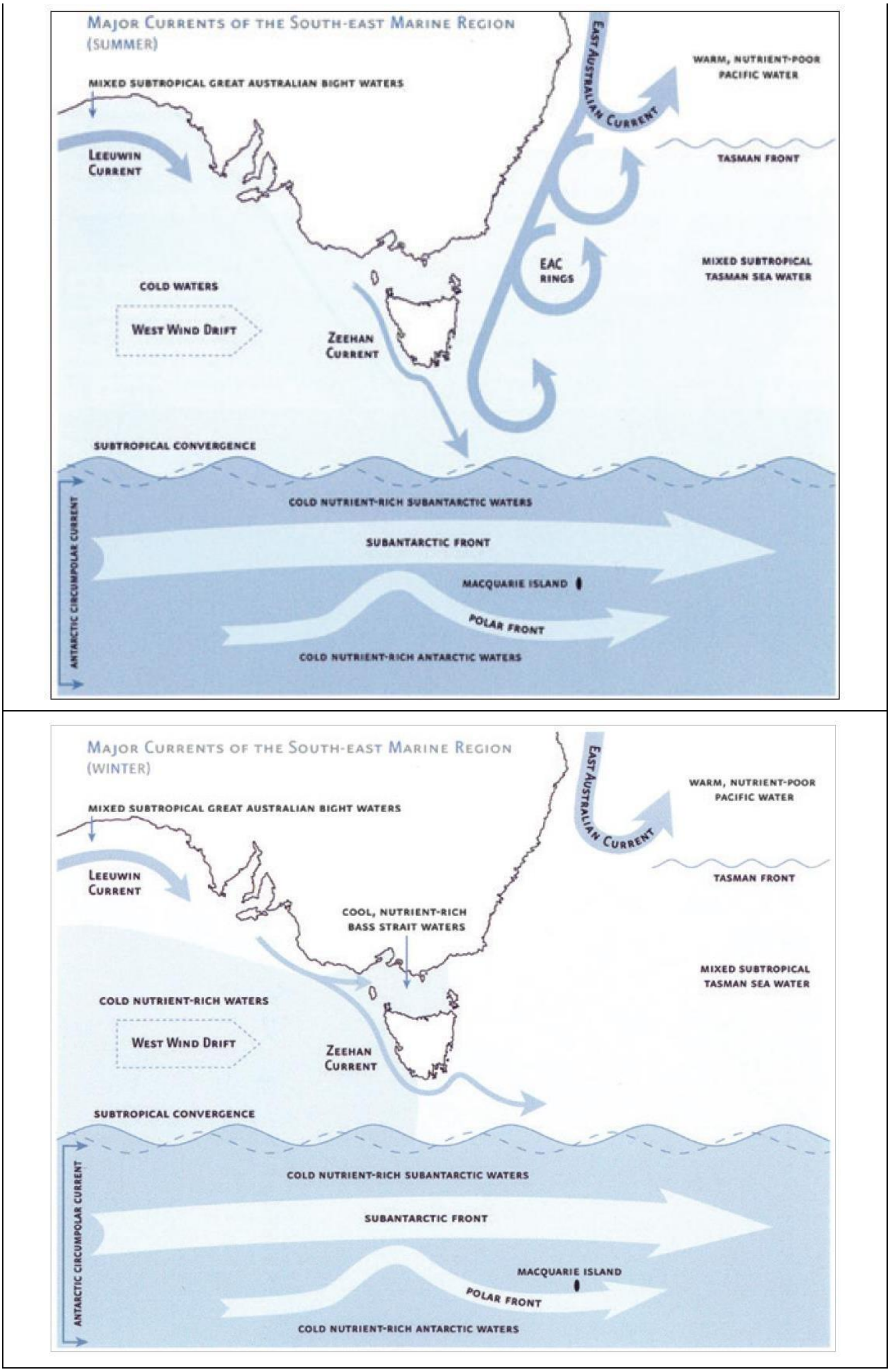
The existence of a deeper flowing westward (SW – NW) current (i.e. which won't likely affect the shallower Otway Basin operational areas), the Flinders Current, also influences the current regime across the region. This current flow is sourced from Subantarctic Mode Water and the Tasman Outflow and is defined by its westerly flow along the continental slope of South Australia. However, its existence, first noted by Bye (1972) is still based on very limited observations and output from ocean circulation models. Middleton and Cirano (2002) show the Flinders Current to be seasonal in strength, strongest during summer, whilst winter is characterised by westerly winds and current flows that oppose the Flinders Current.

In the deep ocean, the water column may be vertically divided into a surface wind-driven layer extending typically to a depth of 20 m and occasionally as deep as 100 m and an interior pressure-driven layer including the thermocline region and extending down to the final bottom boundary layer.

The relatively steep bottom gradient (when it exists) characterising the continental slope region adds a further degree of complexity to the current driving forces. Wind-forcing are of importance in the upper well-mixed layer. However, unusually high-speed currents (in excess of 1 m s^{-1}), are known to be associated with the continental slope region in many parts of the world and cannot be explained by wind forcing. It is thought that these currents may be associated with internal tides. The internal tides are a form of internal wave induced by density anomalies resulting from advection due to barotropic (i.e. normal) tidal motion, of stratified water across the continental slope. The internal tide is known (from previous measurements) to not be significant in the Otway Basin operational areas. Should it occur (considered quite unlikely), the internal tide effect will be confined to shelf slope water depths of approximately 150 to 250 m.

In the Otway Basin, tidal currents are also slightly mixed; but predominantly semidiurnal (i.e. ebbing and flooding on a 12 hour cycle), with irregularities in range and time between highs and lows each day. The barotropic tide will typically exhibit four current reversals (and four current speed peaks) each day.

Provis and Lennon (1981) tide measurements on the shelf edge show that tidal currents are expected to flow at typical mean speeds of only 0.05 - 0.10 m s^{-1}, occasionally reaching 0.15 m s^{-1} at the surface. These values being reduced by as much as 50% near the seabed. Tidal currents will typically flow roughly towards the north-east/south-west (i.e. roughly across bathymetric contours). Tidal currents are quite negligible in comparison with other current mechanisms within the operational areas. The amplitude of the barotropic (depth independent) tide is attenuated with distance offshore from the coast and associated tidal currents are of only low speed in the region. These currents would be negligible in the operational areas.



Source: DoE (2015b).

Figure 4-17: Major ocean currents in south-eastern Australian waters during summer (top) and winter (bottom)

4.5.4.3. Wave Climatology

The ambient deep water wave climate across the operational areas is composed of both sea and swell waves. Sea waves are locally generated wind waves and have periods less than approximately 8 seconds. As such, the sea wave climate will typically largely reflect the wind climate. Surface wind waves which are generated by distant remote storms and propagate to a site independently of the storm, are known as swell and they have much longer periods up to and occasionally over approximately 20 seconds.

There is very minimal monthly or seasonal variation in wave direction (RPS 2022). Total and swell waves approach predominantly from the south-west throughout the year, while sea waves approach more frequently from the east throughout the year. On average, higher, slightly longer-period swell dominated total waves occur during winter than during summer. The Otway Basin operational areas and the Southern Ocean are strongly dominated by swell waves throughout the year.

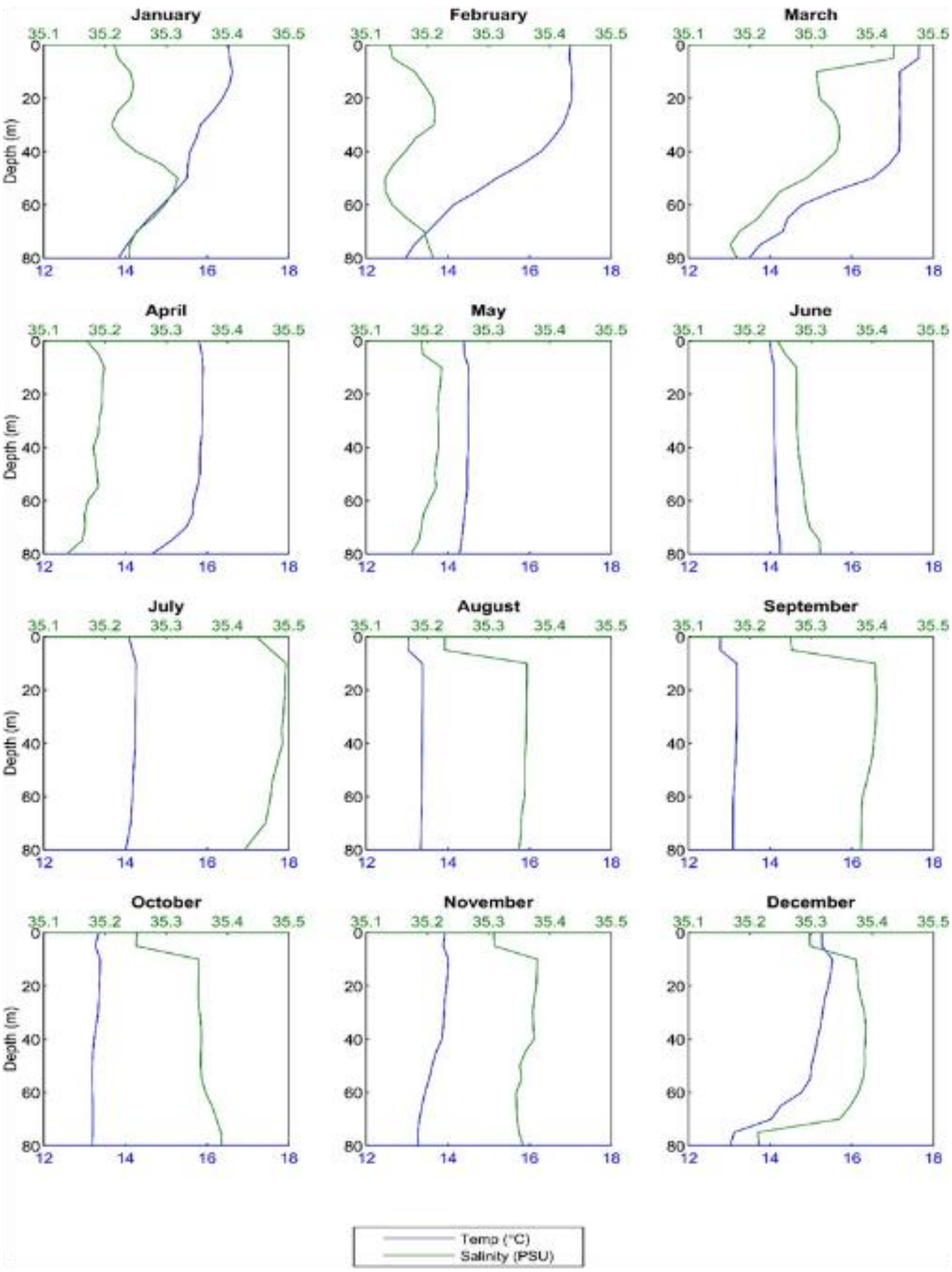
The low pressure systems/extratropical cyclones, predominantly those of the winter months, generate the highest total waves, which are a combination of the local storm wind generated waves (seas) and the perennial south-west background swell from distant extratropical storms. These total sea states are the controlling storm type for the area.

4.5.4.4. Water Temperature and Salinity Distributions

In general, seawater temperatures will decrease with increasing depth mostly in the summer months, while in the winter months the shallower continental shelf waters of the Otway Basin will typically be well mixed due to the strong winds and high waves and, as a result, there will typically only be a small temperature variation between the surface and seabed (i.e. nearly isothermal conditions) (RPS 2022). The near-surface seawater tends to reach a maximum value in mid-late summer (February – March) and a minimum value in mid-late winter (September – October). The near-seabed seawater tends to also reach a maximum value in mid-late summer (February – March) and a minimum value in late winter – early summer (September – November). RPS (2020) reports that the temperature in the top 30 m of the water column in the region (based on the World Ocean Atlas) varies from 13 to 17°C across the year. In the shallower waters of the EMBA Parks Victoria (2006) notes that surface water temperatures range from 13°C in the cooler months to 17.5°C in the warmer months.

There is very minimal variation in salinity through the shallow water columns in the Otway Basin, monthly or seasonally with all values essentially between about 35 and 36 PSU (RPS 2022).

Figure 4-18 shows the slight variation in temperature and salinity both seasonally and over depth in the region.



Source: RPS (2020). Depth of 0 m is the water surface.

Figure 4-18: Temperature (blue line) and salinity (green line) profiles for the region

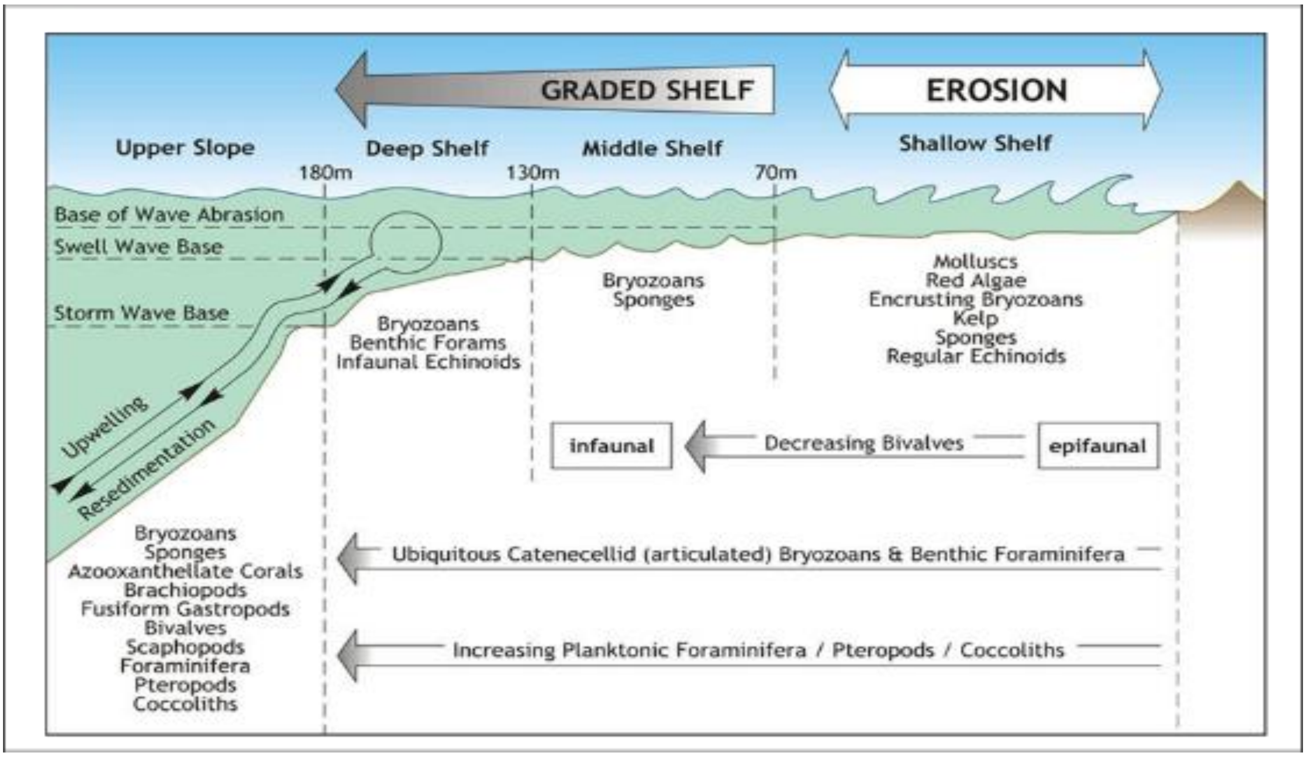
4.5.5. Geomorphological Characteristics

The south-eastern section of Australia's continental margin includes the Otway Shelf, Bonney Coast, Bass Strait, and the western shelf of Tasmania. The Otway Shelf is 400 km long and lies between 37° and 43.5°S and 139.5°E and 143.5°E. The intercontinental basin of Bass Strait has an area of 66,000 km^2 and extends approximately 400 km east-west and 250 km north-south between 39° and 41° S (James and Bone 2010).

A conceptual model was developed that divided the Otway bioregion continental margin into four depth related zones consisting of the shallow shelf, middle shelf, deep-shelf, shelf edge/upper slope (Figure 4-19).

As the EMBA overlaps all four zones, a description of the benthic environment and species supported in each is provided below:

- Shallow shelf (0 to 70 m) – contains exhumed limestone substrates that host dense encrusting mollusc, sponge, bryozoan and red algae assemblages with epifauna such as bivalves
- Middle shelf (70 to 130 m) – a zone of swell-wave shoaling and production of mega-rippled bryozoan and sponge sands
- Deep shelf (130 to 180 m) – a zone with accumulations of intensely bioturbated, fine, bioclastic sands supporting bryozoans, benthic forms and in-faunal echinoids, and
- At the shelf edge/upper slope (greater than 180 m) – supports aphotic bryozoan/sponge/coral communities.



Source: Boreen et al. 1993.

Figure 4-19: Model of the geomorphology of the Otway Continental Margin

4.5.5.1. Bathymetry

The bathymetry of Bass Strait is gently sloping with water depths increasing gradually from the shore to a maximum of about 1,000 m as shown in Figure 4-20. The region's seabed is characterised by a mixture of basins, terraces, plateaus, banks, deep escarpments, canyons and areas of continental rise (Harris et al. 2005).

Mainland Tasmania and the Bass Strait islands belong to the same continental landmass as mainland Australia. The continental shelf is narrow along the east coast of Tasmania but broadens in the north-west and north-east, underlying Bass Strait and the Otway and Gippsland Basins. The central part of Bass Strait contains a depression that exchanges water with the ocean to the north of King Island. The main seafloor feature of western Bass Strait is a ridge that extends from King Island to north-west Tasmania.

The southern shelf or coastal boundary of the Australian mainland is a maximum width of 200 km in the central GAB which narrows to 20 km on the Bonney coast of South Australia/Victoria (Butler et al. 2002). Bass Strait, to the east of the Bonney coast, consists of a broad shallow region, bordered on the eastern and western sides by very deep waters of the continental slope. The depth of the shelf at the Bonney coast increases gradually to 100 m where a distinct increase in steepness is observed (Butler et al. 2002). The continental slope and abyssal plain are connected by several very large and steep canyons along the Bonney coast, which are thought to contribute to upwelling events and local biodiversity (Butler et al. 2002).

To the west of Tasmania there are also numerous canyons cut from the continental shelf at about 300 m depth to the abyssal plain (approximately 3,500 m depth) with the shallower continental margin characterised by gentle to moderate sloping ground (NOO 2002). On the continental shelf, the seabed slopes gradually upwards in a northerly and easterly direction across the shelf to a depth of about 30 m within 1 km of the coastline.

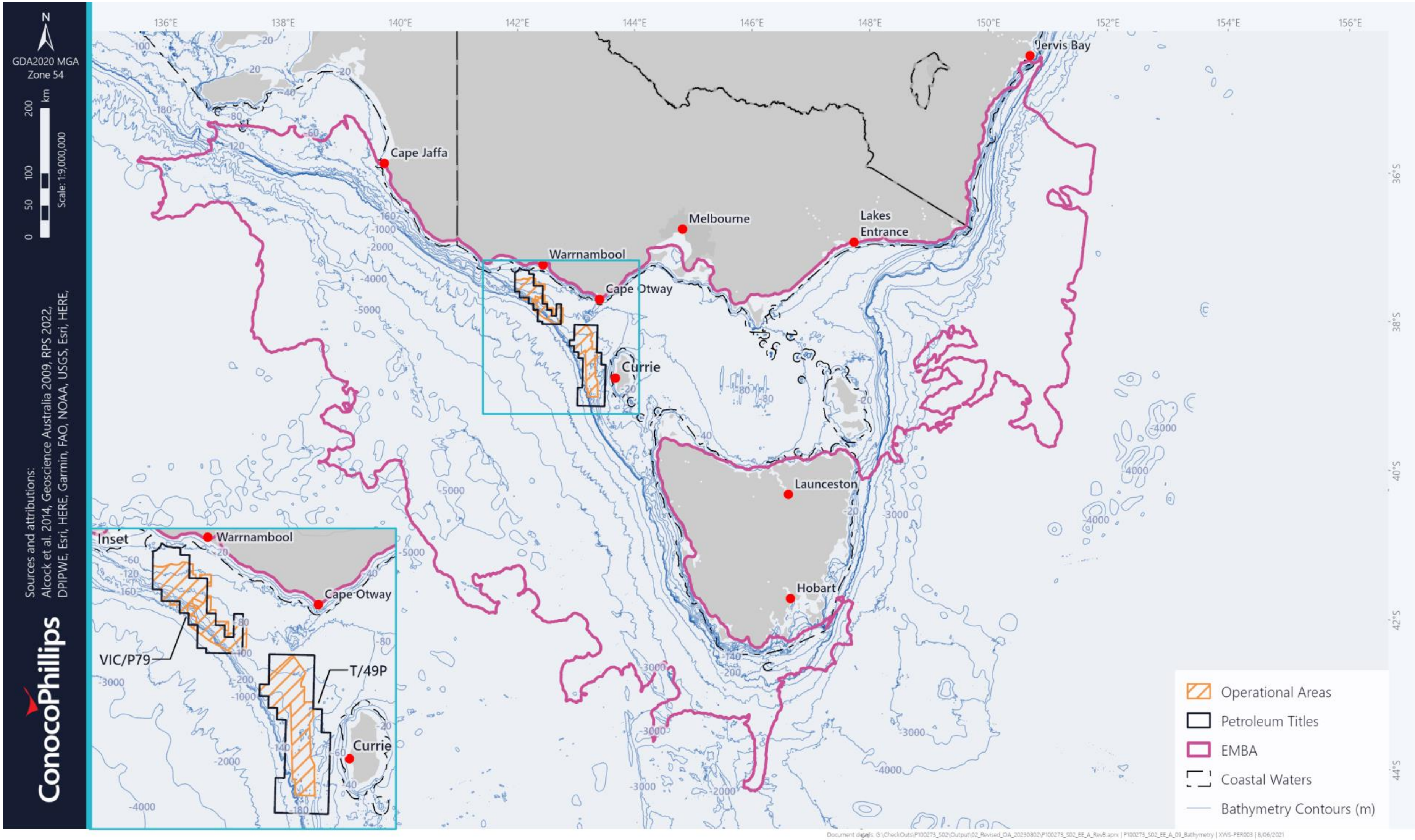


Figure 4-20: Bathymetry of Bass Strait

4.5.5.2. Oceanic Sediments

Boreen et al. (1993) examined 259 sediment samples collected over the Otway Basin and the Sorell Basin of the west Tasmanian margin. Samples were taken during two research cruises (January/February 1987 and March/April 1988) on the RV Rig Seismic using dredges, corers, grabs and a heat-flow probe. Based on assessment of the sampled sediments the authors concluded the Otway continental margin is a swell-dominated, open, cool water, carbonate platform.

Carbonate content of sediments in Bass Strait are generally greater than 50%, and range to over 90% in central Bass Strait (Passlow et al. 2006). With the exception of restricted occurrences of limestone and beach rock, the carbonate fraction in coarse sediments consists of recognisable skeletal debris derived from bryozoans, molluscs and foraminifera. Surveys carried out by Museum Victoria and Geoscience Australia in 2003 were conducted to quantitatively describe and assess benthic invertebrate and sediments from Bass Strait. The two surveys utilised swath mapping, video and seabed characterisation via acoustic facies mapping and seabed sampling of parts of Bass Strait (Passlow et al. 2006). Results based on detailed examination of grain size, carbonate content and composition of samples, resulted in the identification of four sediment categories:

- Bryozoan and lithoclastic sand and gravel – The most abundant and widespread in the samples examined, dominating the western and eastern margins of Bass Strait
- Bioclastic and lithoclastic fine sand – Represents finer-grained sediments deposited in lower-energy environments, such as central Bass Strait or in sheltered areas with high tidal current activity, such as east of Flinders Island
- Quartz sand – The distribution occurs locally east of Cape Otway, and north of Flinders Island
- Carbonate sandy mud and muddy sand – Represents the only muddy sediments examined in detail in this study and includes multimodal fine-grained muddy sands or muds with no gravel content. Samples examined are restricted to the area adjacent to Bass Canyon, the only deep-water area sampled in the survey (Passlow et al. 2006).

Benthic substrate across the Bass Strait is displayed below in Figure 4-21.

A recent hydrographic survey commissioned by the University of Tasmania in collaboration with Parks Australia and IMAS surveyed both the Zeehan AMP Multiple Use Zone, part of which overlaps the T/49 operational area, and the Franklin AMP. A total of 701.5 km^2 (75%) and 271.2 km^2 (40%) of the Zeehan multiple use zone and the Franklin AMP was surveyed, respectively.

A summary of the Zeehan Multiple Use Zone backscatter results are summarised below:

- Eastern edge smooth sediments that correspond with the undulating terrain
- The middle section pavement area shows a light return of swept pavement and ledges which contrast the with the soft-sediments laying in deep troughs
- The shelf slope (western edge) indicates a more consolidated seabed with less sediment due to the slope and prevailing currents (Davey et al. 2022).

A summary of the Franklin AMP backscatter results are summarised below:

- Consistent backscatter values over northern reef/rock shelf
- Deeper water contains sediment variations that run parallel in a north-south direction (Davey et al. 2022).

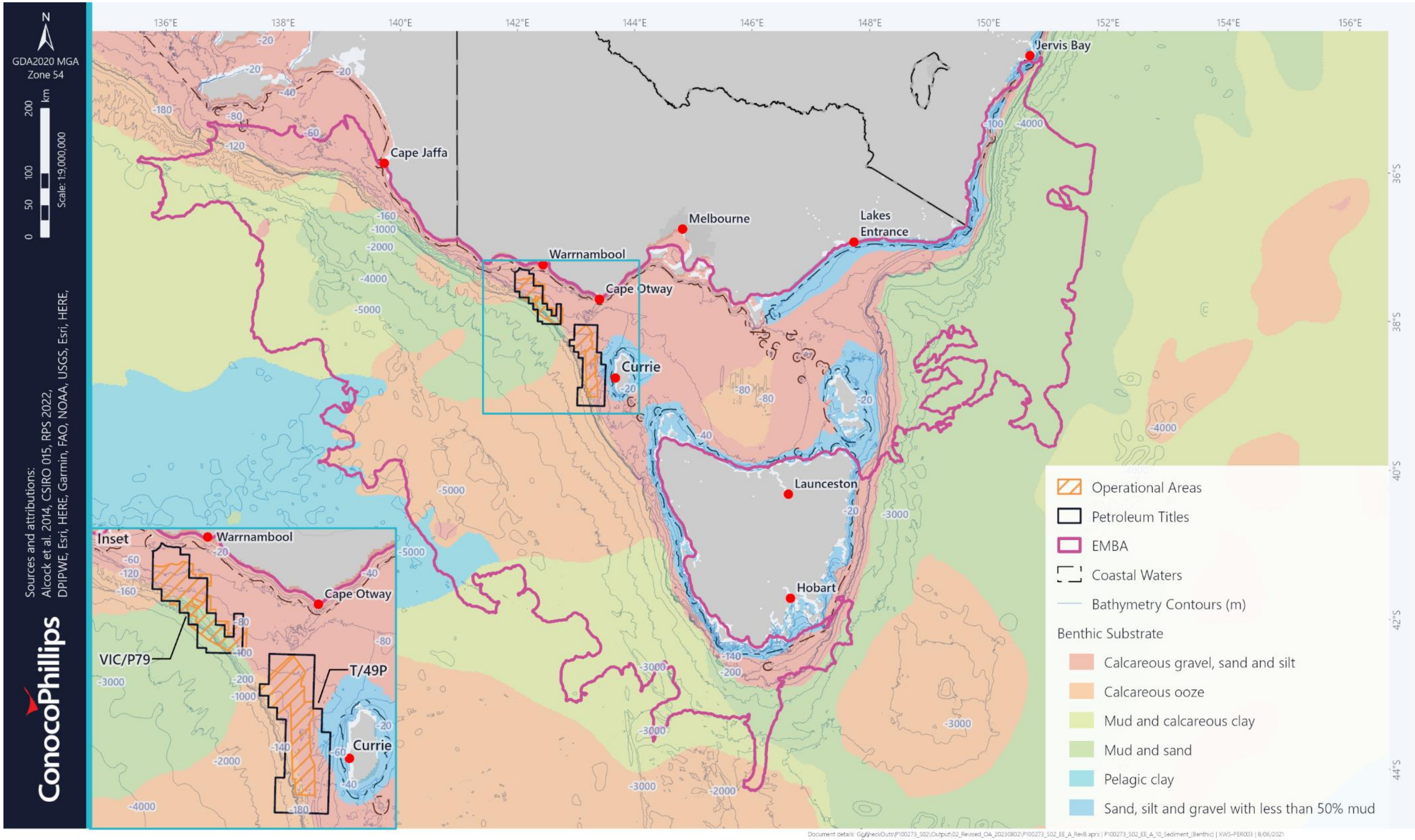


Figure 4-21: Benthic substrate across Bass Strait

4.5.5.3. Nearshore Seabed

The seabed in the nearshore parts of the EMBA is mapped using the Seamap Australia database (2022) developed by the University of Tasmania and the Institute for Marine and Antarctic Studies (IMAS). Table 4-3 describes the seabed in the areas intersected by the EMBA, broken down into states and local government authorities (LGA) in Victoria due to the availability of data.

Table 4-3: Seabed areas intersected by the EMBA

Seabed Area	Description
Victoria	
Glenelg	This LGA includes the towns of Nelson and Portland. The nearshore seabed at Nelson is a mixture of low-profile reef, sand and soft substrate. East of Nelson towards Portland, including Discovery Bay Coastal Park, soft substrate interspersed with seagrass are dominant seabed features. Further, at Cape Bridgewater there is a large section of reef that supports populations of invertebrate species. The nearshore seabed at Portland is a blend of mixed sediment, reef, soft substrate and hard substrate. These seabed features support macroalgae, seagrass and a variety of undifferentiated algae and invertebrates.
Moyne and Warrnambool	The nearshore seabed east of Tyrendarra towards Port Fairy is dominated by hard reef substrate while Port Fairy is a mixture of soft substrate and reef which typically occurs further offshore. South of Warrnambool there is a large section of soft substrate while east of Warrnambool towards Peterborough is dominated by subtidal rocky reef which extends far off the coast. Minimal patches of soft substrate are interspersed between reef habitats.
Corangamite	The nearshore seabed between Peterborough and Princetown is characterised by subtidal rocky reef that extends far off the coast. Large patches of reef are separated by areas of soft substrate particularly east of Port Campbell to Princetown. East of Princetown is dominated by reef habitat.
Colac Otway	The nearshore seabed west of Cape Otway is characterised by gently sloping soft substrate. South of Cape Otway is an extensive area of subtidal reefs that extend east around the Cape. The nearshore seabed at Apollo Bay is characterised by gently sloping soft substrate and an absence of reef habitat. Nearshore, to the east, reef habitat is common while sandy sediments are dominant further from the coast. Cape Patton, Point Hawdon and Point Grey are the exception to this general pattern, whereby reef habitat is dominant throughout the mapped nearshore area.
Surf Coast	The nearshore seabed from Lorne to Torquay is primarily soft substrate with subtidal rocky reef present further away from the coast, particularly between Lorne and Anglesea.
Greater Geelong	East of Torquay to Point Lonsdale, the nearshore sediments are mainly soft substrate with subtidal rocky reef habitat dominant further away from the shoreline. Within Port Phillip Bay, the northern Mornington Peninsula coast is dominated by an uninterrupted extent of nearshore sandy sediments from Point Nepean to Sorrento.
Mornington Peninsula	The nearshore seabed of the southern Mornington Peninsula coast from Point Nepean to Flinders is predominantly subtidal rocky reef and rocky substrate with intermittent patchy areas of soft substrate. East of Flinders, seagrass communities are present in the nearshore environment among soft substrate and an absence of hard substrate.
Bass Coast Shire Council and Bass Coast	The southern nearshore seabed of Phillip Island is dominated by subtidal rocky reef with intermittent and sparse areas of soft substrate from Summerland to Surf Beach. East of Surf Beach until Cape Woolamai, soft substrate seabed is common with only some interspersed areas of rocky substrate. The northern and eastern nearshore seabed of Phillip island is dominated by soft substrate which support communities of seagrass, saltmarsh and mangroves. The seabed adjacent to Kilcunda comprises distinct patches of subtidal rocky reef and soft substrate. Around Cape Paterson and the Bunurong MNP, extensive areas of subtidal rocky reef are dominant (up to 1 km wide in some areas) with soft substrate present further offshore. The seabed of Venus Bay is exclusively soft substrate which supports saltmarsh and mangrove communities.
South Gippsland	The nearshore seabed off the coast of Cape Liptrap is mapped with extensive areas of subtidal rocky reef. East of the cape adjacent Walkerville is an area of mixed soft substrate with offshore reef before transitioning to continuous soft substrate and an absence of hard substrate in Waratah Bay. The western parts of Wilsons Promontory are dominated by soft substrate, with small and isolated areas of rocky reef located around the offshore islands. The eastern parts of Wilsons Promontory are dominated by soft substrate, with small and isolated patches of reef and forests of seagrass within the inlet.
Wellington	The nearshore seabed between Port Welshpool and Saint Margaret Island is mapped as a mixture of soft substrata, mixed soft substrata, mixed biota. Within this there are saltmarsh and seagrass communities bordering the nearshore islands. The nearshore seabed between Saint Margaret Island and Lakes Entrance is almost entirely dominated by soft substrate.
East Gippsland	The nearshore seabed between Lakes Entrance and Mallacoota is dominated by soft substrate. The township of Marlo has two small sections of subtidal rocky reef east of Ricardo Beach. The seabed adjacent Cape Conran features nearshore subtidal rocky reef before transitioning to predominantly soft substrate seabed

	to the east. Subtidal rocky reef is present south of Pearl Point before becoming mostly soft substrate again further to the east. The nearshore seabed south of Mallacoota are dominated by subtidal rocky reef with intermittent areas of soft substrate. East of Mallacoota is dominated by soft substrate with areas of reef concentrated around the offshore islands of Gabo Island and Tullaberga Island. Mallacoota inlet and its seagrass communities are also intersected by the EMBA.
Tasmania	
Tasmania	Seamap Australia (2022) presents benthic spatial data and has been used to describe in part the seabed within the nearshore Tasmanian section of the EMBA. The north-west coast of Tasmania from Stanley to Hunter Island is mapped as predominantly sand, with seagrass present in the strait between Robins Island and Tasmania. Hunter Island to Wynyard continues this trend and is mapped predominately as sand, however there are intermittent patches of reef and cobble interspersed within. The seabed around the Kent Group is mapped as predominantly sand with areas of hard consolidated substrate present close to the shoreline. Nearshore seabed mapping of King Island and the west coast of Tasmania is not included in the database.
South Australia	
South Australia	Seamap Australia (2022) presents benthic spatial data and has been used to describe in part the seabed within the nearshore South Australian section of the EMBA. The benthic spatial data between the VIC/SA border and Robe is mapped predominately as low to medium profile reef (macroalge) with interspersed areas of sand. Sand segments are typically close to the shoreline and have a dominant presence at the shoreline of Canunda National Park, Beachport and Robe. Further, there is very limited consolidated hard substrate (reef) that is dispersed sporadically throughout the area.
New South Wales	
NSW	Seamap Australia (2022) presents benthic spatial data and has been used to describe in part the seabed within the nearshore NSW section of the EMBA. Between the Victoria/NSW border and Akolele benthic habitat is mapped predominately as sand, with intermittent patches of hard consolidated substrate (reef) typically close to the shoreline. In particular, the coastline seabed of Beowa National Park is dominated by bare or rocky reef. There are also patches of soft unconsolidated substrate interspersed throughout, particularly around Eden where soft substrate is the dominant seabed feature. Alkoele to Jervis Bay is mapped as a mixture of sand, reef and soft unconsolidated substrate. Soft unconsolidated substrate is often apparent in large clusters and interspersed with hard consolidated substrate. Murramarang National Park and Batemans Bay is dominated by reef and sand seabed features while Jervis Bay is almost completely covered by soft unconsolidated substrate. Further, the majority of coastal inlets present within the EMBA show benthic habitat that is characteristic of seagrass and saltmarsh communities, particularly around the shoreline.

4.5.6. Ambient Light

Ambient light is defined as the light that is already present within an environment. Any additional emission of light will result in a change in the ambient light. Natural ambient light sources offshore are dominated by solar and lunar luminescence but can also include bioluminescent emission from some marine organisms and incandescence emissions from electromagnetic radiation expressed as lightening.

In addition to natural sources of ambient light there are also anthropogenic activities that emit artificial light. Within the Otway Basin artificial light emissions can be expected from both permanent (e.g. onshore/ offshore development) and temporary (e.g. vessel) activities. Closer to shore, particularly in coastal communities, natural light is considered to be a community value. Major population centres and areas associated with popular tourist attractions and their potential presence within the light EMBAs are assessed in Table 4-4 below.

Table 4-4: Suburbs and localities located within the light EMBAs

	T/49P		VIC/P79 Southern extent*		VIC/P79 Northern extent*	
Suburbs and Locality	**Light EMBA**	**Flaring EMBA**	**Light EMBA**	**Flaring EMBA**	**Light EMBA**	**Flaring EMBA**
King Island Population: 1,617		✓				
Peterborough				✓		✓

	T/49P		VIC/P79 Southern extent*		VIC/P79 Northern extent*	
Suburbs and Locality	**Light EMBA**	**Flaring EMBA**	**Light EMBA**	**Flaring EMBA**	**Light EMBA**	**Flaring EMBA**
Population: 322						
Port Campbell Population: 440				✓		✓
Princetown Population: 236				✓		
Warrnambool Population: 31,308				✓		✓
Killarney Population: 195						✓
Port Fairy Population: 3,742				✓	✓	✓
Yambuk Population: 284						✓
Narrawong Population: 462						✓
Portland Population: 10,016						✓

* Light impacts associated with VIC/P79 have been assessed for northern and southern extents to reflect the spatial extent of the permit area and proximity to the Victorian coastline.
Source for population statistics: ABS 2021.

Although light levels at any one time are affected by natural and artificial sources in the vicinity, once sources are removed light levels will return to natural levels with no lasting or long-term changes. In that respect, ambient light is very resilient to change, and will return to the existing condition immediately once anthropogenic influences are removed.

4.5.7. Ambient Sound

Ambient sound is defined as the level of background noise that is already present within a given location, taking into consideration existing noise sources. Any additional emission of sound will result in a change in ambient sound.

In the Otway Basin natural sea sounds, including physical and biological sources, are expected to be the dominant source of ambient sound. Underwater physical sound sources are dominated by wind but also include rain and sporadic earthquakes (Hildebrand 2009). Acoustic monitoring commissioned by Origin off the coastline of Warrnambool and at nearby offshore sites identified that ambient underwater sound in coastal areas is generally higher than offshore, with a mean of 110 dB re 1 µPa and maximum of 161 dB re 1 µPa (Origin 2013).

In addition to natural sources of ambient sound there are also anthropogenic activities that emit artificial sound. Within the Otway Basin artificial sound emissions can be expected from both permanent (e.g. offshore development) and temporary (e.g. vessel) activities. Anthropogenic activities known to occur within the region include shipping, commercial fishing and small vessel traffic, petroleum production and exploration-drilling activities and sporadic petroleum seismic surveys.

Although sound levels at any one time are affected by natural and artificial sources in the vicinity, once sources are removed sound levels will return to natural levels with no lasting or long-term changes. In that respect, ambient sound is very resilient to change, and will recover immediately once anthropogenic influences are removed.

4.6. Ecological Environment

The key sources of information for the species that may be present in the EMBA are presented in this section from data obtained via the EPBC Act PMST and SPRAT databases, as well as the South-East Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013) and the Temperate East Marine Reserve Network Management Plan 2018 (DNP 2018). A copy of the PMST is provided in Appendix B.

4.6.1. Benthic Habitats and Communities

Benthic communities are biological communities that live in or on the seabed and typically contain light-dependent taxa such as algae, seagrass and corals, and/or animals such as molluscs, sponges and worms, that obtain their energy by consuming other organisms or organic matter. Benthic habitats are the seabed substrates that benthic communities grow on or in and can range from unconsolidated sand to hard substrates, such as rocky reefs, occurring individually or in combination.

4.6.1.1. Existing Data within Operational Areas

Seamap Australia (2022) does not extend into the offshore environment, therefore, identification of benthic habitat within the operational areas occurs through a number of sources. CAMRIS (2015) contains spatial information of the distribution of 10 different types of seafloor sediment in the Australian region. Sediment areas that overlap the operational area are listed in Table 4-5. Soft sediment types as detailed such as calcareous ooze and mud typically support a higher diversity of benthic infauna compared to the more dynamic and abrasive sand-dominated sediments which are unfavourable for soft-bodied burrowing and filter feeding infauna species (Beach 2022). Polychaete worms and crustaceans are common in these sediment types. Benthic habitats with coarser sediment types such as gravel and coarse sand are known to support patches of low-density epifauna including bryozoans, cnidarians and sponges depending on depth, light and temperature conditions (Beach 2022).

In the 1980’s, The National Museum of Victoria, now the Museum of Victoria, began an intensive survey of benthic invertebrates and demersal fishes of the Bass Strait (Wilson and Poore 1987). Data on sediment type is detailed in Table 4-5; however data on benthic invertebrates and habitat classification has not been summarised or published.

The Atlas of Living Australia (2024) provides data from a number of sources with records of human observation and specimen sampling. Whilst it provides species lists it does not provide habitat classification.

Previous surveys have been undertaken in titles adjacent to all 3 operational areas (VIC/ P43, VIC/ L23, T/L2, VIC/ PL36 and VIC/ PL36(V)). These surveys indicate the surficial sediments are carbonate rich coarse to medium sands with areas of exposed limestone substrate. The epifauna is dominated by low density, sessile sponge assemblages (Beach 2022).

Beach Energy commissioned a seabed site assessment for the Otway Gas Development (Beach 2022). The seabed site assessment was undertaken from November 2019 to January 2020 and ranged in water depths from 70 – 104 m, in titles VIC/ P43, VIC/ L23, T/L2, VIC/ PL36 and VIC/ PL36(V) adjacent to the east of the VIC/P79 North operational area.

As summarised in the Beach Otway Operations EP, the sediment samples for infauna were collected at two of the gas fields, Artisan and Thylacine (Ramboll 2020 as cited in Beach 2022). The Artisan field is closer to shore, whilst Thylacine is further offshore. For benthic infauna, a total of 22 morpho-species were identified, from a total of 45 organisms collected from the grab samples, most of which were polychaete worms or crustaceans. All sites were dominated by sand, which typically have a lower abundance and diversity of infauna given that this abrasive type of substrate tends to be more easily subjected to laminar flows that move the sediment more dynamically than muddy substrates (Beach 2022). This is reflective of the sand sediment types in the southeast and northern sections of VIC/P79 North operational area.

The composition and percent coverage of epifauna was assessed from photographs of the seafloor taken with a drop camera system (Ramboll 2020 as cited in Beach 2022). Photographs were taken at the anchor points for proposed well locations within titles VIC/ P43, VIC/ L23, T/L2, VIC/ PL36 and VIC/ PL36(V). Percent cover ranged from 0 to 80% of the sample photograph for all samples but on average the percent cover was typically no more than 37%. Of the individual epibenthic organisms, Gastropoda sp. 2 (a cone shell) and crionids (featherstars) were the most abundant. The general impression of the seafloor is of an unmodified marine environment that supports a patchy complex of branching epibiota (i.e., bryozoans, gorgonian cnidarians and sponges). This complex was highly patchy, covering 0.25 m^2 on average but could be found in patches of at least 0.4 m^2. A microscopic examination of a qualitative sample of this epibiota indicated that this complex of fauna provide microhabitat for a range of macrofauna such as amphipods, isopods, polychaete worms and molluscs (Beach 2022). By comparison, there was a low abundance and diversity of infauna living within the sediment which is expected for coarse sand substrates. This type of substrate is highly mobile making it difficult for filter feeders and soft bodies invertebrates to survive and establish significant populations. Ramboll (2020) summarise that the epibiota on the seabed in the vicinity of the Thylacine and Artisan gas fields is representative of what is expected at depths around 70 – 100 m (Beach 2022). The Beach Otway Offshore Operations EP characterises the seabed of the EMBA as a carbonate mid shelf and deeper sections (60 – 70 m) of the shallow shelf with surficial sediments of carbonate rich coarse to medium sands with areas of exposed limestone substrate. The epifauna is dominated by low density, sessile sponge assemblages. The VIC/ P79 North Operational Area is adjacent to this survey in depths ranging from 53-383 m. The Beach Energy Otway Basin Survey results are expected to be representative of the VIC/ P79 North operational area where it is at similar depths of 70- 104 m.

As described in the Beach Otway Operations EP, surveys were previously undertaken in 2003 for the pipeline right-of-way options from the Otway Gas Project EIS (Woodside 2003 cited in Beach 2022). The findings from the Beach Energy Otway Basin Survey align with findings from the Otway Gas Development studies (CEE Consultants Pty Ltd 2003; BBG 2003; cited in Beach 2022 and Boreen et al. 1993; cited in Beach 2022). BBG (2003) found that the substrate in water depths between 66 and 82 m were predominantly low-profile limestone with an incomplete sand veneer that supported a low to medium density, sponge dominated filter feeding community. Fish and other motile organisms were uncommon. CCE Consultants found that at depths of 60 – 92 m benthic assemblages varied from low to high density, sessile, sponge dominated, sea urchin dominated and micro algae dominated areas. These findings are likely to be indicative of the benthic environment in the VIC/P79 North operational area at similar depths.

Note, there is limited survey information available for depths greater than 104 m.

Table 4-5: Benthic studies within the vicinity of the operational areas

Study	VIC/P79 North Operational Area	VIC/P79 South Operational Area	T/49P Operational Area
CAMRIS (2015)	• calcareous ooze (southwest section) • calcareous gravel, sand and silt (northern section) • mud and sand (southeast section)	• calcareous gravel, sand and silt (northern sections) • mud and sand (southeast sections)	• calcareous ooze (western section) • calcareous gravel, sand and silt (eastern section).
Wilson and Poore (1987)	Not overlap with sampling data	Overlaps 3 sampling sites which shows evidence of course sand but data on benthic invertebrates and habitat classification has not been summarised or published.	Overlaps 23 sampling sites. Those located in the northern section of the T/49P operational area showed medium to coarse sand and carbonate material. Calcareous materials are usually characteristic of soft sediment habitats while sand, silt and gravel are characteristic of sandy substrate habitats. This suggests a mixed environment. Sampling sites located to the south of the T/49P operational area and positioned on the start of the continental slope also showed medium to coarse sand.
The Atlas of Living Australia (2024)	Records of invertebrate diversity including southern rock lobster, giant crab, arrow worms, 2 families of bivalve, 11 families of gastropod, 12 families of copepod and one species of amphipod.	Records of invertebrate diversity including 28 families of polychaete worms, 10 families of copepods, 4 families of cumaceans, 6 families of amphipods, 2 families of tanaidaceans, 4 families of decapods, 4 families of brittlestar, 6 families of isopod, 3 families of brachiopod, 10 families of bivalve, 6 families of gastropod, and one species each of crinoid, urchin and branchiopod.	Records of invertebrate diversity including 35 families of polychaete worms, 55 families of arthropod, 2 families of brachiopod, 2 families of stony coral, 6 families of brittlestar, 3 families of urchin, 12 families of bivalve, 11 families of gastropod, 2 species of crinoid and one species of sea cucumber.
Beach 2022 (Includes Ramboll 2020; CEE Consultants Pty Ltd, 2003; BBG, 2003)	Operational area is adjacent to these surveys in depths ranging from 53-383 m. The Beach survey results are expected to be indicative of the of the benthic environment in the operational Area where there are similar depths (approximately 60- 104 m, based on the surveys described	Operational area is adjacent to these surveys in depths ranging from 72- 483 m. The Beach survey results are expected to be indicative of the of the benthic environment in the operational Area where there are similar depths (approximately 60- 104 m, based on the surveys described	Operational Area is directly south/south east of these surveys in depths ranging from 88- 129 m. The Beach survey results are expected to be indicative of the benthic environment in the operational area where it is at similar depths (approximately 60- 104 m, based on the surveys described below)

4.6.1.2. Marine Canyons

Canyons are topographically complex seascapes that contain diverse bottom types, act as conduits for the passage of material down the continental slope and profoundly modify the hydrodynamic regime of the continental margin (Schlacher et al. 2007). As such, canyons are sites of both upwelling (Kämpf 2005), and downwelling events (Wåhlin 2002).

Sponges (Porifera) play a key structural and functional role in the marine benthos of canyons. Sponges can greatly modify the physical properties of the seafloor and influence the composition, abundance and distribution of the fauna (Bett and Rice 1992).

In 2004, seafloor mapping and collection of sponges was undertaken at five prominent marine canyons in south-east Australia. All five of these canyons are located within the EMBA (Figure 4-22) (Schlacher et al. 2007). The survey identified a rich sponge fauna array in the canyons with a relatively small collecting effort. A total of 14 sled samples yielded 165 species, 65 genera, 41 families and 10 orders (Schlacher et al. 2007). Broad comparison with seamounts in the Tasman and Coral Seas indicate that the canyon megabenthos may rival or exceed that of seamounts in terms of sponge richness (with seamounts conventionally regarded as benthic hotspots in the deep sea, characterised by high levels of benthic biomass, diversity and endemism (Richer de Forges et al. 2000).

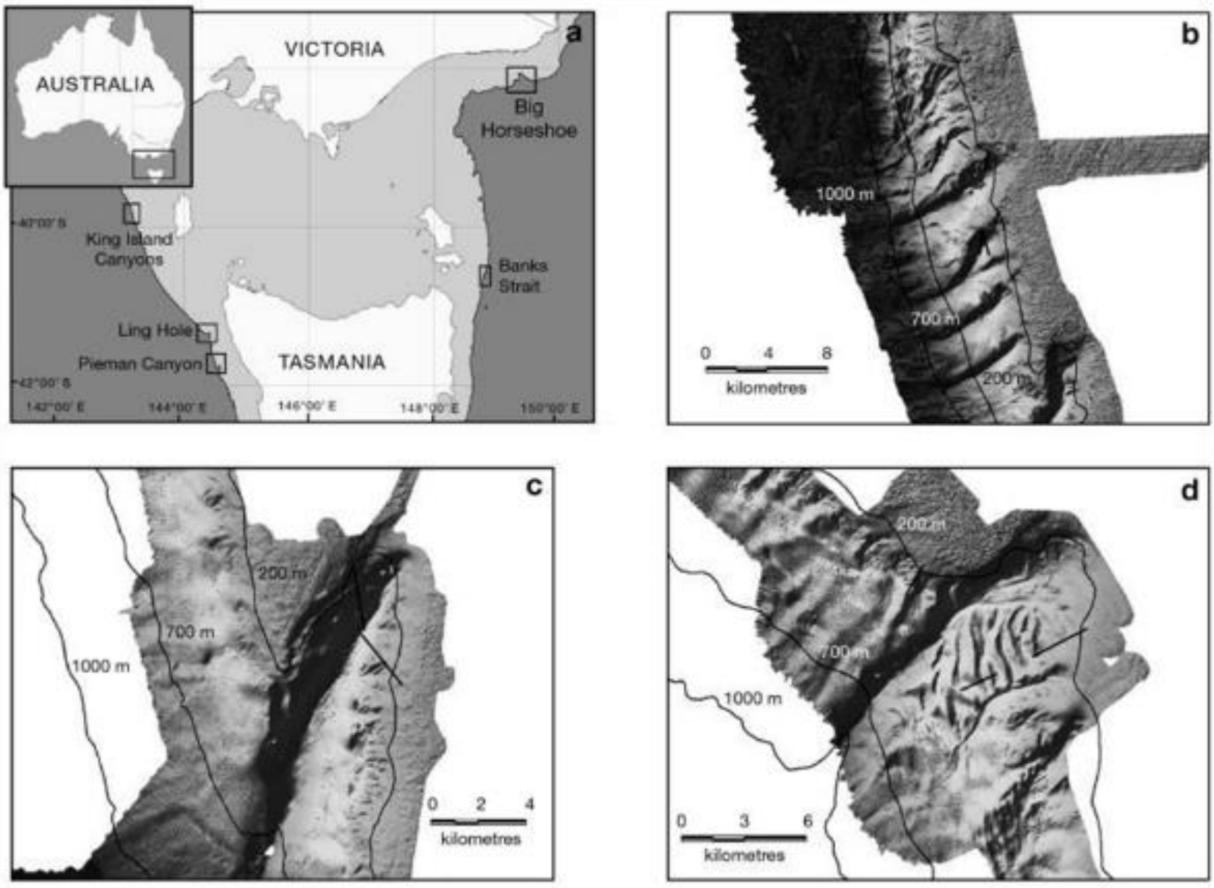


Fig. 1. (a) Locations of canyon sampling sites off southeastern Australia; (b) King Island canyons; (c) Pieman canyon; (d) Ling Hole canyon. Depth contours are 200, 700 and 1000 m as labelled; locations of sled transects are shown as straight lines

Source: Schlacher et al. 2007

Figure 4-22: Marine canyons sampled in south-east Australia

4.6.1.3. Benthic Assemblages

Benthic communities across Bass Strait are determined by the seafloor habitat and have a wide distribution and high diversity. A series of benthic surveys conducted by the Victorian Museum on the continental shelf of the Bass Strait between 1979 and 1984 (Poore et al. 1985; Wilson and Poore 1987) showed infauna communities (living within sediments) to be rich and diverse. Unpublished data suggests diverse soft sediment benthic invertebrate communities comprising mainly of sponges, octocorals, ascidians and bryozoans. However, data on benthic environments within the operational areas is limited. Benthic assemblages known or likely to occur within the EMBA are described below.

Sandy Substrate

In general, the shifting sands of unsheltered nearshore seabed are often too mobile for the development of marine floral communities and lack the necessary hard substrate required for anchoring. As such, these environments can appear barren and featureless on the surface. Nevertheless, a rich abundance of faunal communities may be present among the sands including species of molluscs, bivalves, annelids, crustaceans, and echinoderms.

Soft Sediment

Marine soft sediments comprise one of the largest and oldest habitats in the world and occur in both coastal and deep-sea environments. The difference in species richness and pattern between areas is typically dependent factors such as depth, latitude, temperature, productivity and sediment grain-size (Gray 2002).

A review conducted by Gray (2002) found coastal samples of the Bass Strait to have a high species density in comparison to other Australian coastal samples in Western Port and Port Phillip Bay. The southern coast of Australia is unusual in that reverse estuaries occur where evaporation is larger than the freshwater input. This results in no discharge of sediment from rivers to the marine environment and causes the sediment of the continental shelf to largely be comprised of biogenic material (shells, calcareous tubes, etc.), which has extremely rich fauna (Gray 2002). This may be further related to the assortment sediment, which is characterised by high grain size diversity, poor sorting along with the likelihood that sediments are geologically old and highly stable, all of which contribute to the development of high species richness (Gray 2002).

Subtidal Rocky Reef

Rocky reefs provide a stable seabed for a wide range of plants and animals including kelps and other seaweeds and encrusting invertebrates such as sea squirts, sponges and bryozoans. In turn fixed biota provide habitat and food for mobile animals including molluscs, octopus, crustaceans, and a wide range of fish species. There have been a wide range of studies of nearshore reef biota in Victoria including work for the Environment Conservation Council's marine coastal and estuarine investigation (Ferns and Hough 2000). The nearshore reefs along Victoria's open coastline are characterised by an abundance of brown kelps, with a diverse understorey of red, green and brown seaweeds, sea squirts, sponges, bryozoans, crustaceans and molluscs. There is a degree of variation in the composition of biota on the reefs along the coast but in general most species are represented widely along the Victorian coast. Parks Victoria (2006) notes that the Bunurong MNP and Bunurong Marine Park (both sites with significant areas of subtidal rocky reef and rock platforms located within the EMBA have the highest diversity of intertidal and shallow subtidal invertebrate fauna recorded in Victoria on sandstone.

Coral

Corals are typically divided into two groups: the zooxanthellate ('reef-building' or 'hard') corals and the azooxanthellate ('ahermatypic' or 'soft') corals. Hard corals contain symbiotic microalgae (zooxanthellae) that enhance growth and allow the coral to secrete large amounts of calcium carbonate and can typically be found in shallower (<50 m) waters (Tzioumis and Keable 2007). Further, development by hard corals does not occur further south than Queensland. Soft corals are generally smaller and often solitary and can typically be found in deeper waters throughout the continental shelf, slope and off-slope regions, to well below the limit of light penetration (Tzioumis and Keable 2007). Corals do not occur as a dominant habitat type within the EMBA; however their presence has been recorded around the Tasmanian Seamounts and in Point Addis Marine National Park.

The EPBC Act PMST report lists one species of coral, the **cauliflower soft coral** (*Dendronephthya australis*), with the potential to occur within the EMBA (Appendix B) and none with the potential to occur within the operational areas. The cauliflower soft coral (EPBC Act: Endangered) is a temperate soft coral species that is endemic to eastern Australia and has no known occurrence outside of NSW. The key threat to cauliflower soft coral results mainly from damage caused by boat anchoring and moorings (TSSC 2020b). The species is red in colour and forms globe like colonies that consist of small hard spindles which are supported by the soft bodied structure (TSSC 2020b). They typically can be found in estuaries with sandy seabeds and high current at depths of 1-18 m. Further, the cauliflower coral creates important habitat for a range of marine species like the endangered White's seahorse (*Hippocampus whitei*) which is known to occur only in NSW waters.

4.6.1.4. Marine Flora

South-east Australia is also recognised as having one of the richest macrophyte floras in the world (409 genera with 1,124 species) and the benthic algal communities include more than 200 species of which 165 species are rare (Butler et al. 2002). This is thought to be the result of complex interactions of past geological events, the influence of the warm water Leeuwin Current and the isolation of the Australian continent (Phillips 2001). The subtidal and intertidal rocky reefs of Bass Strait, located closer to the shoreline of Victoria and Tasmania, are understood to have a high diversity of plant species including seagrasses and macroalgae. Victorian Biodiversity Atlas (VBA) (DELWP, 2022) records for the EMBA include 99 species of marine flora including red, green and brown algae species, with the most commonly recorded genera detailed below and displayed in Figure 4-24.

- Green algae (*ulva spp.*) – Commonly called sea lettuce. These species are widely distributed across the coasts of the world's oceans and can grow in water depths up to 75 m but require high levels of sunlight to thrive.
- Red algae (*Corallinaceae* spp.) – A family of calcified red algae that typically inhabit coral reefs and are distinguished by their characteristic sporangial chambers that are clustered into sori.
- Brown algae (*Ecklonia radiata*) – A kelp species that grows in kelp beds on reefs and where sheltered it can form dense forests. It can be found in the low intertidal zone to depths of approximately 25 m around the world.
- Brown algae (*Sargassum* spp.) – These species can be found worldwide distributed across tropical and subtropical waters. They grow on hard substrates in open surf-zones forming large beds.
- Red algae (*Rhodophyta* spp.) – Species in this phylum have a wide distribution and can survive in tropical, temperate or cold-water environments and exist in both freshwater and marine habitats.
- Green algae (*Caulerpa remotifolia*) – This species can be found in subtidal sandy or muddy sediments confined to sheltered inlets in depths up to 15m in South Australia, Victoria and Tasmania.
- Brown algae (*Phaeophyceae* spp.) – This species ranges from microscopic filaments to giant kelps that can reach 60 m in length. The larger multicellular species produce a large biomass with high growth rates and form marine forests that serve as habitats for a diversity of organisms.
- Brown algae (*Dictyota dichotoma*) – This species grows on rock substrates in well-lit areas with little water movement. They display a wide distribution and are typically found at depths up to 30 m.

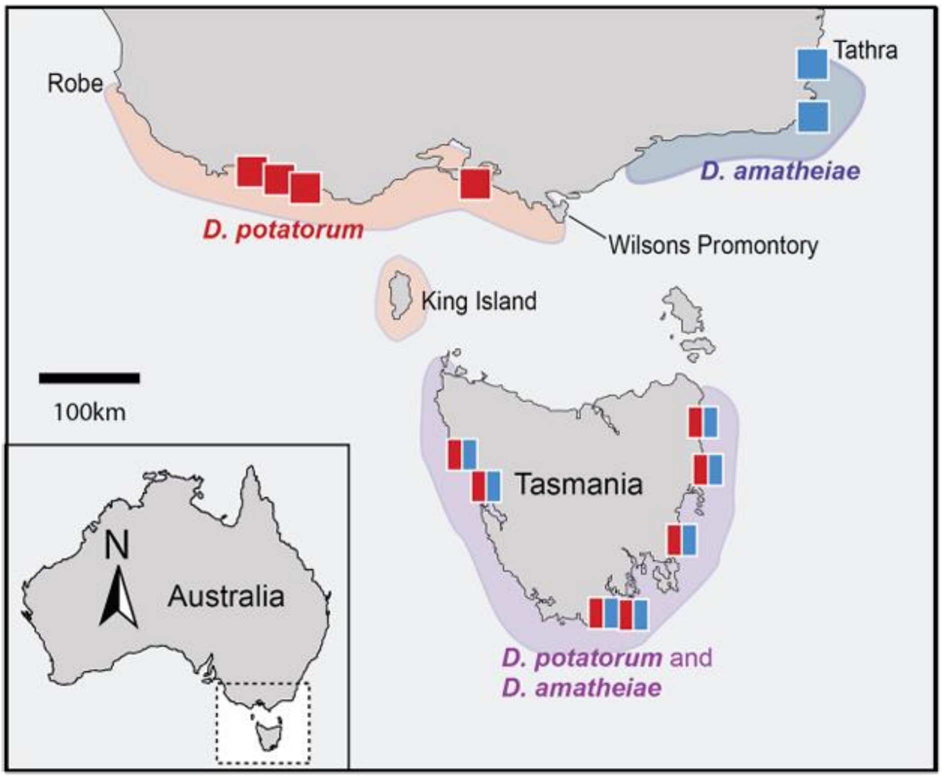
Kelp

Kelp is a group of brown algae which attach to solid structures and form forests on the seabed. They provide shelter, food and nursery habitat for a variety of marine species, including fish, invertebrates and other marine flora species. The majority of kelp found in Victoria occurs along the coast on rocky reefs in water depths up to 30 m (VFA 2022a).

In addition to its ecological benefits, certain kelp species, such as bull kelp, are also commercially and culturally significant in the south east of Australia (Kirkman and Kendrick 1997; Thurstan et al. 2018). Bull kelp is a fast-growing species with large, heavy leaf-life fronds that energy from a strong holdfast which connects the organism to the seafloor. These species require rocky reef substrate for attachment and a wave-exposed environment (Velásquez et al. 2020). Two species of bull kelp, or southern bull kelp, can be found in Australia along the coasts of south eastern Australia (Source: (Velásquez et al. 2020)

Figure 4-23); *Durvillaea potatorum* and *Durvillaea amatheiae* (Velásquez et al. 2020). In Tasmania, particularly along the coastline of King Island and the north west coast of mainland Tasmania, beach-cast bull kelp (*Durvillaea potatorum* only) is harvested and produced as alginate and agar, cattle feed, garden fertilisers, and feed for abalone hatcheries (Kirkman and Kendrick 1997; Velásquez et al. 2020). Currently the Marine Plant Fishery in Tasmania has 70 licence holders and is responsible for approximately 5% of the world production of alginates (DPIPWE 2017). See further detail on the Tasmanian Marine Plant Fishery in Section 4.7.8.8.

Further, bull kelp, *Durvillaea potatorum*, has a long history of harvest by the First Nations people of Australia for uses which include cultural activities, ceremonial activities, medicinal uses, clothing, cultural history, food, fishing, shelter and domestic uses (Thurstan et al. 2018).



Source: (Velásquez et al. 2020)

Figure 4-23: Distribution of *Durvillaea* spp. in Australian waters

Seagrass Communities

Found in sheltered parts of shallow bays, inlets and estuaries, seagrasses establish extensive underwater meadows that can be important for both nutrient cycling and as habitat for juvenile fauna and invertebrates. Seagrasses are often called nursery habitats because the leafy underwater canopy they create provides shelter for small invertebrates (such as crabs, shrimp and other types of crustaceans), small fish and juveniles of larger fish species. Seagrass leaves absorb nutrients and slow the flow of water, capturing sand, dirt and silt particles which, along with their roots, trap and stabilise sediment. This process helps to improve water clarity and quality and reduce erosion of coastlines and provides suitable habitat for benthic infauna. Seagrass beds are an important component of unique food webs whereby the seagrass may be consumed directly by grazers, provide substrate for epiphytic organisms to colonise and eventually nutrients for detritivores (PV 2006). Known seagrass communities present within the EMBA are displayed in Figure 4-24.

Seagrass communities are not expected within the operational areas.

Mangroves

The term 'Mangroves' refers to a group of woody salt tolerant (halophytic) plant communities that have the ability to adapt to the extreme transitional zone between the marine and terrestrial environment (Basha 2018). They are typically found in sheltered bays, inlets and estuaries and grow in the intertidal environment where adapted aerial roots (pneumatophores) provide gas exchange for the primary root during low tide. Mangroves provide a variety of ecosystem functions including coastal protection, nursery habitat, shelter, carbon sequestration, pollution control and enhanced water quality (Basha 2018).

Victoria is home to the southernmost occurrence of mangroves in the world which are located at Millers Landing in southern Corner Inlet near the Wilsons Promontory National Park (Harty 2009). Victorian communities are dominated by the single species of white or grey mangrove (Avi*cennia marina var. australasica*) and are known to occur at sites within the EMBA Figure 4-24.

There is no potential for interaction with mangrove communities within the operational areas.

Saltmarsh

Coastal saltmarsh communities are dominated by herbs and low shrubs which can take advantage of inland saline environments, both aquatic and arid. Like mangroves they are extremely tolerant communities existing in the harsh transitional zone between the marine and terrestrial environment (Saintilan 2009). Additionally, saltmarshes provide a variety of ecosystem services such as nursey habitat, feeding and resting habitat for migratory birds, carbon sequestration and coastal protection.

Saltmarshes are found on the coasts of all Australian states however the most extensive saltmarsh development is along the south eastern coast from Sydney to Adelaide Figure 4-24.

There is no potential for interaction with saltmarsh communities within the operational areas.

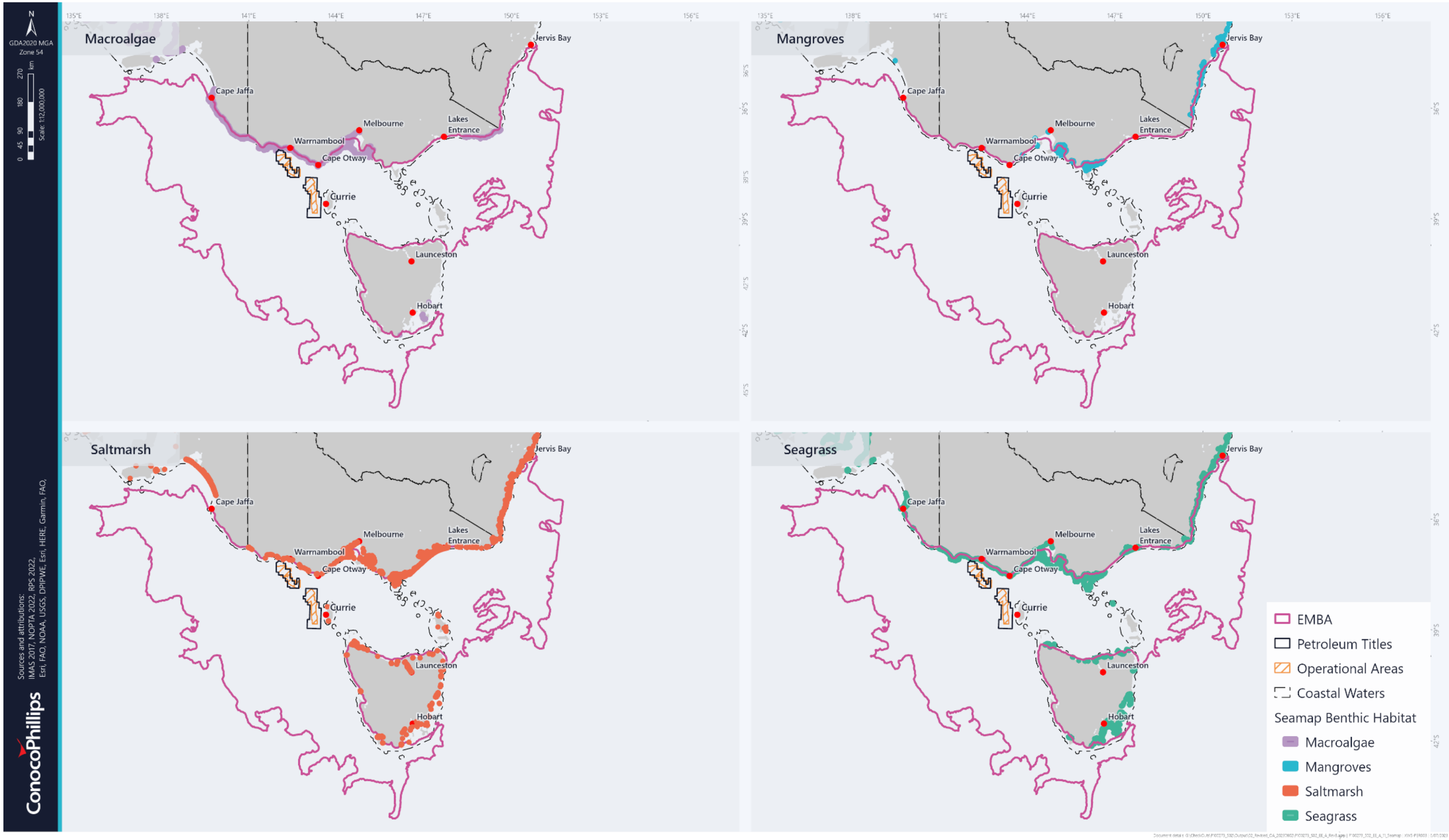


Figure 4-24: Presence of Macroalgae, Seagrass, Mangrove and Saltmarsh Habitat within the EMBA

4.6.2. Coastal Habitats and Communities

The coastal environment throughout southern and eastern Australia is varied and includes areas of rocky cliffs, sandy beaches and tidal flats. Each shoreline type has the potential to support different flora and fauna assemblages due to the contrasting physical factors (e.g. waves, tides, light, etc.) influencing the habitat.

Table 4-6 provides descriptions of shorelines intersected by the EMBA based on Google Earth satellite imagery, ConocoPhillips Australia (2021) and Seamap Australia (2022).

Table 4-6: Shoreline areas intersected by the EMBA

Shoreline Area	Description
King Island (north, west, south-east coasts)	The west coast of the Island is predominantly rocky shoreline with some areas of sandy beach. The longest stretch of beach is located on the north-west coast of the island.
Whistler Point to Cataraqui (King Island)	From Point in the south of the island, the dominant coastal feature is rocky shoreline with small cliffs 5 m above the high-water mark. There are small stretches of coarse grain sand beach or shoreline located in sheltered bays and coves, most notably at Fitzmaurice Bay and Porky Beach. The town of Currie is also located along this stretch.
South of Cataraqui Point	Very steep or vertical cliffs are present until Surprise Point, which features a pebble, cobble or boulder beach. Extended stretches of coarse sand beach are located at Surprise Bay and Colliers Beach.
North of Whistler Point	There is a long stretch of coarse sand beach located at Cooper Bluff and Yellow Rock Beach. At Cape Wickham on the northern cape of King Island, rocky shorelines are dominant until Disappointment Bay where a long stretch of sandy beach extends from Rocky Point down the east coast of the island until Naracoopa.
Cape Bridgewater	The shoreline to the west of Cape Bridgewater is predominately sand beach and includes Discovery Bay Coastal Park which is important hooded plover habitat. To the east of Cape Bridgewater, the coastline is dominated by rocky shores and high coastal cliffs. Seal Point in Cape Bridgewater is a known haul out site for Australian fur seals and New Zealand fur seals.
Portland	The shoreline to the west of Portland is a mixture of high coastal cliffs, rocky shoreline and some areas of sandy beach. Lawrence rocks is located off the south coast of Portland is an important seabird breeding habitat for the common diving-petrel. Portland has multiple beaches which are interspersed with small sections of rocky shoreline.
Port Fairy	The west of Port Fairy between Narrawong and Yambuk is dominated by a long stretch of sandy beaches and is the site of multiple coastal reserves. Near Port Fairy the coastline becomes dominate with rocky shores and rock platforms which are broken up by Taylors Beach and Litte River Beach to the west. Port Fairy Bay is entirely sandy shoreline which continues on to Warrnambool on the east.
Warrnambool	The west of Warrnambool is dominated by sandy shoreline with rock platforms on the shoreline of Merri Marine Sanctuary. Just off the coast are Merri Island and Middle Island which are important habitats for the little penguin and species of seabirds. South of Warrnambool, in Warrnambool Bay the shoreline is entirely sandy which continues out to the east till the end of Logans Beach.
Peterborough	To the east of Peterborough, the shoreline is dominated by coastal cliffs from Logans Beach to Childers Cove. Between Childers Cover and Peterborough coastal cliffs continue to be the dominated shoreline however there are sections of sandy beach, including at Three Mile Beach and at the Bay of Martyrs. This section of the coastline is part of the Great Ocean Road which is known for its dramatic limestone cliffs. At Peterborough the shoreline is mixed between rocky platforms and sandy beaches. Just to the east between Peterborough and Port Campbell the shoreline reverts back to being dominated by coastal cliffs with interspersed sandy beaches. This stretch contains the famous Arch and London Bridge limestone formations.
Port Campbell	The shoreline is predominantly sand beach, intertidal shore platforms and mixed sand beach and shore platforms. South of Princetown is the Glenelg River Estuary and shorebird habitat has been identified on the adjacent sandy beach.
Cape Otway West	This coastline is dominated by intertidal shore platforms and rocky substrate with the near absence of sand beach. The shoreline south of Wattle Hill is dominated by rock platform with a short stretch of sandy beach located at Milanesia Beach. From Johana Beach until Point Flinders, sand beach is dominant with interspersed areas of rock platform as well the Johanna and Aire River Estuaries. At Cape Otway, there is extensive rock platform with interspersed areas of mixed sand beach and intertidal shore platform.
Apollo Bay	East of Cape Otway, the shoreline is a mixture of sand beach and intertidal shore platform. Hooded plover habitat is identified from the Park River Estuary to Shelly Beach. From Marengo to Skenes Creek, sand beaches are dominant in the sheltered area of Apollo Bay. From Skenes Creek until Wye River, the

Shoreline Area	Description
	shoreline is a mixture of sand beach and rock platforms, interspersed with the Smythes Creek, Carrisbrook Creek, Grey River and Kennet River Estuaries.
Lorne	From Wye River to Lorne, the shoreline is characterised by a mixture of sand beach and intertidal shore platform with shorebird habitat identified throughout. At Lorne and Fairhaven there are uninterrupted stretches of sand beach at present. Shorebird roosting and feeding is identified at the Painkalac Creek Estuary.
Anglesea	From Anglesea to Barwon Heads, sand beach is the dominant shoreline type with intermittent stretches of rock platform and intertidal shore platform present. At the Anglesea River Estuary, shorebird feeding habitat has been identified as well as at Addiscot Beach, Thompson Creek Estuary and Thirteenth Beach.
Bellarine Peninsula South	The Barwon River Estuary and shorebird roosting sites are present in this section and sand beach is dominant from Barwon Heads to St Leonards. The northern shoreline of the Mornington Peninsula is primarily sandy beach from Point Nepean to Sorrento with sparse areas of intertidal shore platform.
Mornington Peninsula South	The southern Mornington Peninsula coastline from Point Nepean to Flinders is a mixture of sand beach and intertidal shore platform, with an uninterrupted stretch of sand beach present at Gunnamatta Beach. Shorebird habitat and feeding sites are identified in the Point Nepean National Park, Pelly Point, Cape Schanck, and West Head. North of Flinders towards Balnarring, a mixture of sand beach and intertidal shore platform is present along with numerous identified shorebirds roosting sites, particularly around Shoreham.
Phillip Island	Sand beaches and intertidal shore platform are dominant on the north shoreline of Phillip Island with shorebird habitat identified from Cowes to Summerland. Off the coast of Summerland is Seal Rocks, which is a known breeding and haul-out site for Australian fur-seals. On the southern coast of Phillip Island, sand beach and rock platforms are common. From Surf Beach to Cape Woolamai, sand beach is dominant. The Cape Woolamai coast on the eastern edge of the island is dominated by sandy beach and sand dunes with some isolated areas of cobble/shingle beach. The sandy beach is identified habitat for coastal bird species.
Kilcunda	Starting near Venus Bay, the west-facing beaches continue to be dominated by sandy beaches. West of Anderson Inlet, the shoreline is dominated by mixed sand beach/shore platform and intertidal shore platform. North of Harmers Haven, the shoreline is again dominated by sandy beaches, interspersed by mixed sand beach/shore platform through to San Remo. The coastline of Cape Paterson is dominated by intertidal shore platforms and rock platforms with the complete absence of sand beach in the section potentially exposed to shoreline loading.
Cape Liptrap	The EMBA intersects Waratah Bay, which comprises mostly sandy beaches and intertidal shore platforms. The shoreline around Cape Liptrap is dominated by mixed sand beach/shore platform in the southern area, shifting to mixed cobble/shingle beach/shore platform on the western side of the cape. North of this point, the shoreline is dominated by sandy beaches with small sections of mixed sand beach/shore platform in the more southerly reaches. These sandy beaches are noted to have large numbers of hooded plovers and are backed by the Cape Liptrap Coastal Park.
Wilsons Promontory West	The western parts of Wilsons Promontory intersected by the EMBA are dominated by intertidal shore platforms and interspersed by sandy beaches, particularly in the bays (e.g., Oberon Bay, Norman Beach (Tidal River)) and Darby Beach. The offshore islands in this sector (Kanowna, Cleft, Anser Group, Wattle, McHugh, Glennie Group and Norman islands) are all dominated by intertidal shore platforms and provide important breeding habitat for little penguins, Australian fur-seals and New Zealand fur-seals. All the islands are protected within the Wilsons Promontory Marine National Park (MNP).
Wilsons Promontory East	The shoreline of Wilsons Promontory East is dominated by intertidal shore platform in areas exposed directly to the sea. Sheltered bays, such as Waterloo Bay and Sealers Cove, are dominated by sandy beach and mixed sand beach/shore platform. At these locations, Freshwater Creek estuary and Sealers Creek estuary meet the Bass Strait.
Marlo	The shoreline adjacent the township of Marlo is predominantly sandy beach until the Snowy River estuary, which is continuously open. East of Marlo is continuous sandy beach until Cape Conran where there are areas of intertidal shore platform. Areas of the sandy beach are noted as shorebird roosting sites and hooded plover habitat.
Bemm River	The Bemm River section is predominantly sandy beach east of Cape Conran until Pearl Point, which is noted as mixed sand beach/shore platform. The shoreline east of Pearl Point is sandy beach other than the Tamboon and Sydenham Inlet estuaries, which are both noted as intermittently open. Coastal bird habitat and tern nesting sites are noted as both of the estuary sites.
Point Hicks	The shoreline is primarily sandy beach with isolated areas of intertidal shore platform and mixed sand beach/shore platform. The Thurra River estuary and Mueller River estuary (both intermittently open) are present east of Point Hicks. The Wingman Inlet estuary (continuously open) is located adjacent the Skerries and is identified as hooded plover habitat.
Mallacoota	The shoreline intersected by the EMBA is dominated by mixed sand beach/shore platform with some continuous areas of sand beach present at Secret Beach and Quarry Beach. Four intermittently open

Shoreline Area	Description
	estuaries are located along this stretch of coast. The shoreline east of Mallacoota is dominated by sand beach with mixed sand beach/shore platform present at Cape Howe on the Victoria/NSW border.

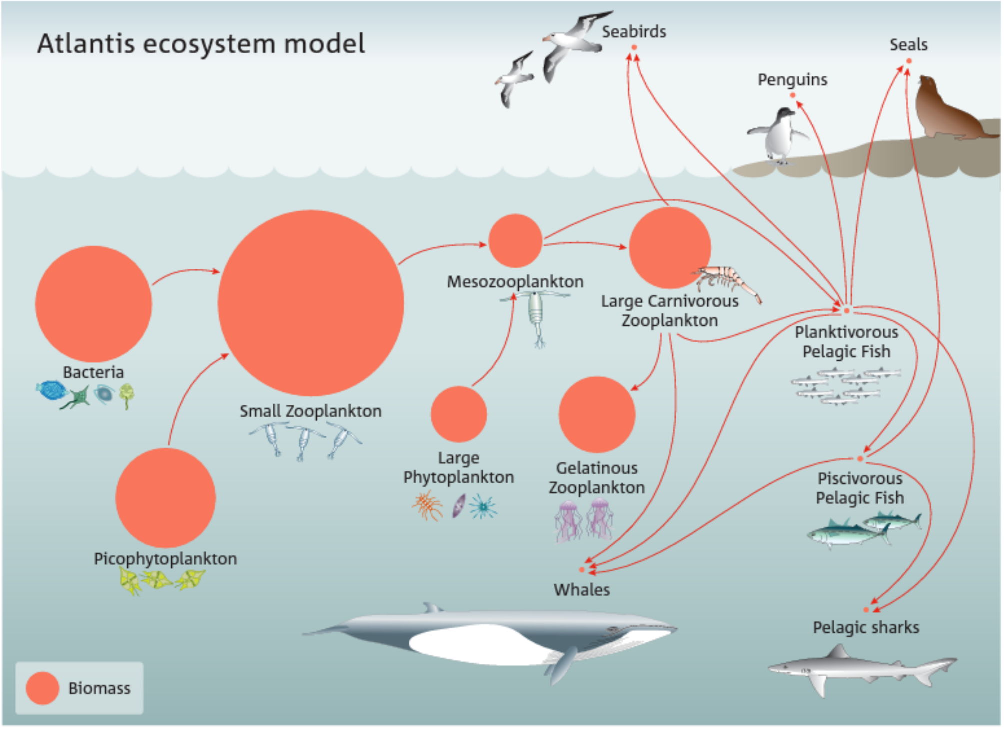
4.6.3. Plankton

Plankton are the dominant biomass of marine ecosystems and a key component in oceanic food chains supporting nearly all marine life (CSIRO 2015b). Plankton distribution is largely determined by local prevailing wind and tide driven current resulting in a limited capacity to avoid damaging environmental stimuli. However, the potential for population level effects is limited due to their widespread distribution, high natural mortality rate, rapid population growth rate and anticipated mixing of both inside and outside of impacted regions (Huntley and Lopez 1992; Richardson et al. 2017). Growth rates in colder regions such as Bass Strait, are expected to be slower than warm regions (Richardson et al. 2017). Plankton are most broadly divided into two groups, namely phytoplankton (microscopic plants) and zooplankton (microscopic animals). Phytoplankton are primary producers that form the basis of marine food webs as they are consumed by zooplankton who are in turn consumed by larger species (Figure 4-25) (CSIRO 2015b).

Zooplankton are comprised of small crustaceans, fish eggs and fish larvae. Zooplankton include species that drift with the currents and those that are motile (i.e. capable of motion). CSIRO (2015b) notes that copepods are the most common zooplankton and are the most abundant animals on earth. Watson and Chaloupka (1982) reported a high diversity of zooplankton in eastern and central Bass Strait, with over 170 species recorded. However, Kimmerer and McKinnon (1984) reported only 80 species in their surveys of western and central Bass Strait.

Krill (*Nyctiphanes australis*), a species of zooplankton, are a common coastal species in southern Australian waters and endemic to the subtropical convergence zone. The species broods its eggs until they hatch rather than spawning them directly into the water column. They reach sexual maturity after about four months and the female lays several broods of eggs in one season. This species plays an important role in the coastal marine food chain and the commercial fishing industry as one of the most important dietary items for PBWs, jack mackerel, short-tailed shearwater, fairy prion, Australian salmon, skipjack tuna and tiger flathead as well as other abundant fish and seabirds (Nicol and Endo 1999). Aggregations of krill vary from swarms or schools that are dense and compact through to large, deep layers that may span kilometres and have the capability to move within a vertical plane, often expressed as diurnal vertical migration (Everson 2000). In the south-east marine region, there are two extensive aggregation areas which result in significant upwelling events and are discussed in Section 4.6.3.1 and 4.6.3.2.

Nyctiphanes australis' range extends from approximately Sydney round the southern coast through Bass Strait to central South Australia, and throughout all Tasmanian coastal waters (Nyan Taw 1978, Ritz and Hosie 1982, in IMAS 2011). There is a main peak of spawning from early spring to late autumn, but reproduction continues through all months with as many as three generations produced each year. This continuous reproduction through the year coupled with its high growth rate means that *Nyctiphanes australis* has very high productivity (IMAS 2011). [Paragraph added in response to Matter: F08].



Source: CSIRO 2015b

Figure 4-25: Representation of marine food web off SE Australia, with the size of spheres representing the biomass of each group

The main threat to plankton including egg and larval stages is climate change and variability. Modelling in south-eastern Australia shows that the regions marine waters have experienced some of the greatest levels of warming observed around Australia and are expected to continue to warm more than other areas (Hobday and Lough 2011; Poloczanska et al. 2012). The potential impacts of climate variability on zooplankton are not well known however preliminary research suggest potential for altered phenology, body size reduction and a change in global distribution (Bonham et al. 2015). Sensitivity to underwater sounds depends on the species of plankton and life history stages as well as environmental and physical parameters such as proximity to the sounds source, water depth and seabed features and location of plankton due to diel migration (including fish larvae) between the surface and deep water.

4.6.3.1. Bonney Coast Upwelling

The Bonney coast upwelling (Bonney upwelling) is located approximately 128 km north-west from the T/49P operational area and 4 km north from the VIC/P79 operational area. This phenomenon occurs when strong south-easterly surface winds induce warm, nutrient-deficient surface waters away from the coastline. This leads to surface upwellings bringing cool, nutrient-rich deep waters closer to the surface where there is enough sunlight for primary production among planktonic organisms to take place (Hosack and Dambacher 2012). This further leads to the aggregation of krill to the area where they are nourished by the upwelling event. Plankton distribution from the upwelling area are dependent upon prevailing ocean currents including the Leeuwin Current, East Australia Current, flows into and from Bass Strait and Southern Ocean water masses. Populations are thought to be highly variable both spatially and temporally and are likely to comprise characteristics of tropical, southern Australian, central Bass Strait and Tasman Sea populations.

The Bonney upwelling is a known foraging ground that seasonally attracts endangered and conservation listed species to the area due to the abundance of krill (DCCEEW 2015a). The primary ecological importance of the Bonney Upwelling is as a feeding area for the conservation listed pygmy blue whale (PBW)

(*Balaenoptera musculus brevicauda*). The upwelled nutrient-rich water promotes blooms of coastal krill (*Nyctiphanes australis*), which in turn attracts PBW to the region to feed. The upwelling is one of only three identified feeding areas consistently used by PBW in Australian coastal waters (Butler et al. 2002). Additionally, a variety of seabirds, fish and higher predator species, such as little penguins and Australian fur seals, also frequent the area due to the abundance of prey (DCCEEW 2015a).

4.6.3.2. West Tasmania Upwelling

A detailed analysis of satellite-derived ocean data (chlorophyll a levels) for the periods 1998-2000 and 2005- 2014 suggests that the western Tasmanian shelf also accommodates a productive ecosystem (Figure 4-26). Based upon the Kampf (2015) study, this region forms part of the Great South Australian Coastal Upwelling System and experiences two phytoplankton blooms per annum:

- The first and larger bloom – occurs in the late austral summer months (typically February-April) resulting from favourable winds that occur between December-April. Stronger upwelling winds do not always create phytoplankton blooms, and
- The second smaller bloom – occurs in spring (October) coincident with the onset of spring bloom in the western Tasman Sea. The mechanism for this smaller bloom remains unclear.

Kampf (2015) identifies that the accuracy of satellite data cannot be used to identify upwelling jets however would suggest the existence of upwelling jets on the western Tasmanian shelf. The significance of these jets is that they operate to disperse nutrient-rich water northwards along the shelf and possibly into western Bass Strait. This advection process would explain elevated chlorophyll a levels in western Bass Strait – a typical feature of the region during austral summer months. The west Tasmania upwelling system lies to the west of the Tasmanian mainland and south-east of the operational areas.

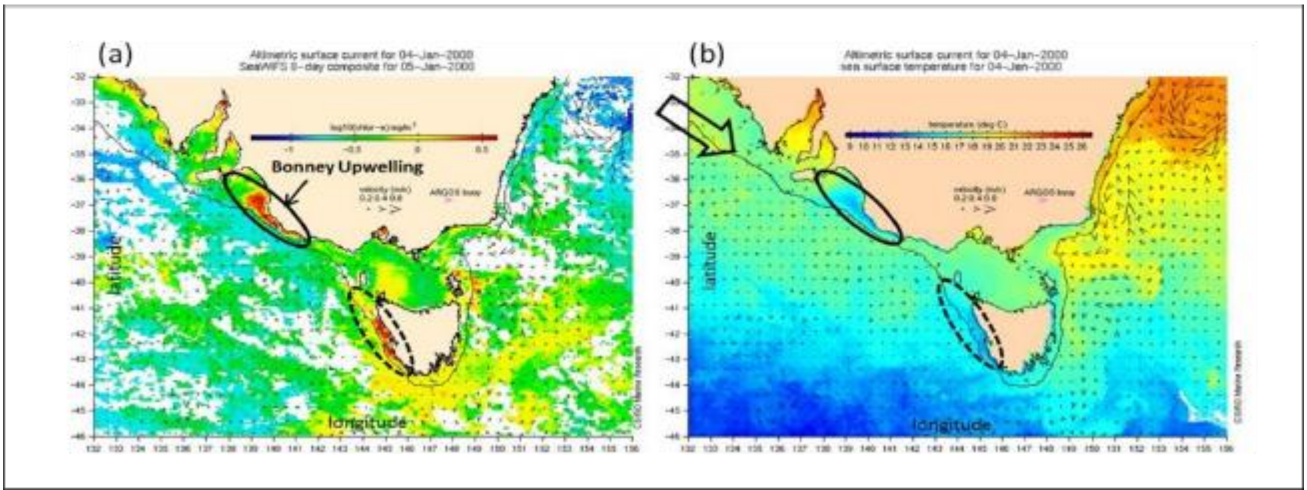


Figure 4-26: Coastal upwelling event in early January 2000 evident in satellite derived distributions of (a) MODIS-OC3 chlorophyll a and (b) sea surface temperature. The large arrow in (b) indicates the pathway of the South Australian Current.

4.6.4. Marine Invertebrates

The Bass Strait region is known to consist of marine invertebrate phylum such as Porifera (sponges); Cnidaria (e.g. jellyfish, corals, anemones, sea-pens); Bryozoa (filter feeders); Arthropoda (e.g. sea spiders, rock lobster, giant crab, krill); Mollusca (e.g. scallop, octopus, crab, lobster); Echinodermata (e.g. urchins, sea cucumbers, seastar); and Annelida (e.g. polychaete worms).

There is little targeted information available on the nature or distribution of epibiota for central Bass Strait, but data is available for the wider Bass Strait region from the Museum of Victoria biological sampling programs conducted from 1979 to 1983 (Wilson and Poore 1987). These studies (Wilson and Poore 1987; Poore et al. 1985) found that invertebrate diversity was high in southern Australian waters although the distribution of species was patchy, with little evidence of distinct biogeographic regions. Benthic habitat suitable for invertebrate populations occurs within the EMBA and includes rocky reefs, sponge beds, unconsolidated sediment supporting bryozoans (IMAS 2019), canyons and the edge of the continental shelf. Williams et al (2009) notes that in surveys conducted along the shelf edge (150-400 m water depths, where the continental shelf drops away sharply to form the continental slope), the following key habitats occur:

- Bryozoan thickets (dominated by emergent bryozoans and small erect sponges and ascidians), where giant crabs are caught
- Low and/or encrusting bryozoans and sponges
- Low microfauna in association with detritus
- Absence of epifauna (often with bioturbation).

The results of invertebrate sampling undertaken in shallower inshore sediments also indicate a high diversity and patchy distribution. In these areas crustaceans, polychaetes and molluscs were dominant (Parry et al. 1990). This information can be used to extrapolate existing conditions for central Bass Strait.

Generally, the epibiota of the region is sparse and characterised by scallops and other large bivalve molluscs, crabs, seasquirts, seapens, urchins, lampshells, polychaete worms, sponges and bryozoans. A variety of mobile crabs, prawns and brittle stars are also relatively common. Many of the mobile epibiota appear to occur in aggregations from time to time (scallops, prawns and crabs) while some of the fixed epibiota occur in patches (sponges and bryozoans). Trawling conducted for the Museum of Victoria biological sampling programs recorded large hauls of sponges along some trawl transects. The main hauls of sponges were located in an arc around southern Bass Strait (Passlow et al. 2006). These sessile invertebrates, including sponges, bryozoans, hydroids and ascidians, form single species or mixed aggregations on the seabed that increase the vertical structure of benthic habitat and provide shelter from predators on the seafloor (Maldonado et al. 2017). Due to the increased habitat complexity that sponge assemblages provide, these areas are associated with localised increases in biodiversity (Maldonado et al. 2017). It is likely that the sponges referred to in Butler et al. (2002) and Maldonado et al. (2017) provide a similar ecosystem function when aggregations form in central Bass Strait.

These habitats generally have a lower productivity than seagrass and macroalgal beds due to the absence of large photosynthesising plants, however they are often rich in small invertebrates that live on microscopic algae, bacteria and food particles in the passing water. These in turn provide food for larger surface dwelling and burrowing invertebrates, which in Tasmanian waters are dominated by crustaceans, polychaete worms, gastropods and bivalve molluscs (Parsons 2011). According to DPIPWE (2020a), very little is known of Tasmania's offshore marine ecosystems as there have only been limited surveys of benthic biota. However, it is known that unvegetated soft sediments (sand, mud and other unconsolidated substrates) are the dominant feature of the subtidal marine environment in Tasmania, comprising around 75% of the seabed in nearshore areas (Parsons 2011).

Invertebrate species (or species habitat) have been identified by PMST searches of the EMBA. The searches identified no BIAs for invertebrates and one threatened invertebrate species, Tasmanian live-bearing seastar (*Patiriella vivipara*), protected under the EPBC Act which is detailed below. Further, the presence of commercial invertebrate fisheries overlapping the EMBA demonstrates the presence of multiple invertebrate species (or species habitat). These species are considered to be valued and commercially relevant and are also detailed below.

4.6.4.1. Echinodermata

Phylum Echinodermata includes sea stars, sea urchins, sea cucumbers and sand dollars. Distinguishing features of this phylum include their radial symmetry, an internal skeleton composed of calcium carbonate and a water-vascular system which functions primarily in movement but also in water exchange and nutrient uptake. One threatened Echinoderm species has been identified within the EMBA and one species of significance that is commercially fished in sections of the operational areas, and therefore likely to be present within the EMBA, has been identified. Both are discussed below.

The **Tasmanian live-bearing seastar** (*Patiriella vivipara*) (Vulnerable) is the only EPBC Act protected invertebrate species found within the EMBA. It is a tiny orange-yellow seastar that grows up to 15 mm in diameter with five short arms that form a rounded pentagon shape. They are endemic to Tasmania and inhabit sheltered waters of no more than 1.2 m in the upper intertidal zone of rocky areas (DoE 2009). There are 13 estimated isolated populations across southern Tasmania. This species is a self-fertilising hermaphrodite whose young develop within the gonadal sac and emerge on the surface of the adult after sufficient development. This limits the species' ability to disperse widely, unlike species with a free-swimming larval stage (DoE 2009). The main identified threats to the Tasmanian live-bearing seastar are interspecific competition, displacement and potential predation from introduced seastars, and habitat modification and destruction (DoE 2022).

The **long-spined sea urchin** (*Centrostephanus rodgersii*) is a commercially important species known to occur within the operational areas and is considered likely to be present within the EMBA. Individuals can be found inhabiting the crevices of reefs and rocky surfaces. They are native to NSW and eastern Victoria and over the past few decades have expanded their distribution south into eastern Tasmania. This is thought to reflect the extension of the warm south-flowing Eastern Australia Current which has created favourable conditions in previously unfavourable environments (Cresswell et al. 2021). This has presented a challenge in multiple jurisdictions as at high densities this species can be damaging to marine biodiversity. The urchins feed on seaweed and kelp beds and due to an absence of predators the overgrazing creates urchin barrens which dramatically decreases the primary production of a marine environment (Great Southern Reef 2022). Only species, like lobster, with specialised adaptations – teeth, pincers, claws are able to pierce through the urchin's extensive protective features.

Stock status records show the long-spined sea urchin to be sustainable through all jurisdictions (NSW, TAS, VIC). Figure 4-27 shows the distribution of reported commercial catch of this species in south-eastern Australia (Cresswell et al. 2021) which indicates that it is likely they will be present in the EMBA. This species is currently not under pressure from anthropogenic threats, with current efforts focused on the proactive management of urchin overgrazing such as rebuilding urchin predators and upscaling culling and/or harvesting activities (Great Southern Reef 2022).

Source: Cresswell et al. 2021

Figure 4-27: Distribution of reported commercial catch of the long-spined sea urchin

4.6.4.2. Crustaceans

Crustaceans belong to phylum Arthropoda and include rock lobsters, prawns, crabs and barnacles. Crustaceans possess an exoskeleton that they moult to grow. Their bodies are composed of segments grouped into three parts: the cephalon (head), thorax and the pleon (abdomen). Crustaceans are distinguished from other arthropods by the possession of biramous (two-parted) limbs and by their larval forms. Most aquatic crustaceans are free-living, though some are sessile. Two species, the southern rock lobster (SRL) and giant crab, are commercially fished in blocks that overlap the operational areas and are considered likely to be present within the EMBA.

The **southern rock lobster (SRL)** (*Jasus edwardsii*) is a commercially important species that is found on coastal reefs from the south-west coast of WA to the south coast of NSW, including Tasmania and the New Zealand coastline (Figure 4-28). SRL are found in depths up to 150 m (DPI 2009). In Victoria, the abundance of SRL decreases from west to east reflecting a decreasing area of suitable rocky reef habitat (DPI 2009).

Most adult SRL remain within the same region (moving less than 1 km), though some tagged SRL have moved more than 80 km between inshore and offshore reefs (SRL 2021). More broadly in the region, SRL habitat occurs as patchy, discontinuous low-profile reef running parallel to the coast. Bathymetry mapping, including recent shelf mapping funded by Parks Australia of the Zeehan Multiple Use Zone (partially overlapped by the T/49P operational area), found the existence of multiple marine canyons in the area as well as areas of deep reef extending across the shelf from the shelf-break. The outer shelf region is limestone reef pavement that becomes significantly more fractured with notable long step-features which were rarely undercut limiting habitat available for crevice-dwelling species such as the SRL (Barrett et al. 2023). Preliminary research in the area has found that while multibeam sonar mapping has identified areas of suitable reef, 300 camera drops identified no lobsters which is likely due to the absence of suitable crevice-like habitat (Barrett et al. 2023). Therefore, the Zeehan Multiple Use Zone is likely low-quality habitat (Barrett et al. 2023) for the SRL at ecologically or commercially important levels. In any case, it is assumed that where rocky reef is located within the EMBA, SRL are likely to be present.

Adult SRL are carnivorous and feed mostly at night on a variety of bottom dwelling invertebrates such as molluscs, crustaceans and echinoderms. The main predators of SRL are octopus, sharks and reef fish such as wrasse and ling (SRL 2021).

The life cycle of the SRL is complex. After mating between April and July (SRL 2021), fertilised eggs (up to 1,000,000 per female) are carried under the tail of the female for approximately 4-6 months before being released, typically between September and November. Larval release occurs across the southern continental shelf, which is a high-current area, facilitating dispersal. Oceanographic modelling has also indicated that SRL dispersal occurs over large spatial scales, indicating that there is a single biological stock (Bruce et al. 2007). Genetic analyses also indicate that it is a single stock (Ovenden et al. 1992). This suggests that SRL in the Otway Bioregion present as a connected stock with recruitment into the permit area from upstream subpopulations.

Once released, SRL larvae, or phyllosoma, live in the plankton and undergo 11 developmental stages over a period of 12 and 24 months (Hartmann et al. 2013; SRL 2021) while being carried by ocean currents up to 200 km offshore far beyond the continental shelf. At the end of this developmental phase, phyllosoma larvae moult and metamorphose into a puerulus larvae (a transparent miniature version of the adult), still living in the water column but not feeding (SRL 2021). Successful metamorphosis from the final-stage phyllosoma to puerulus stage occurs far offshore sometimes even beyond the continental shelf (SRL 2021). The puerulus swim inshore at night to settle onto reef habitat in depths from 50 m to the intertidal zone (Booth et al. 1991) where they moult into pigmented juvenile lobsters (SRL 2021). Bruce et al. 2007 reported data for state-maintained puerulus collector sites, which indicates that most puerulus settlement in NW Tasmania occurs June through August, tapering off in September.

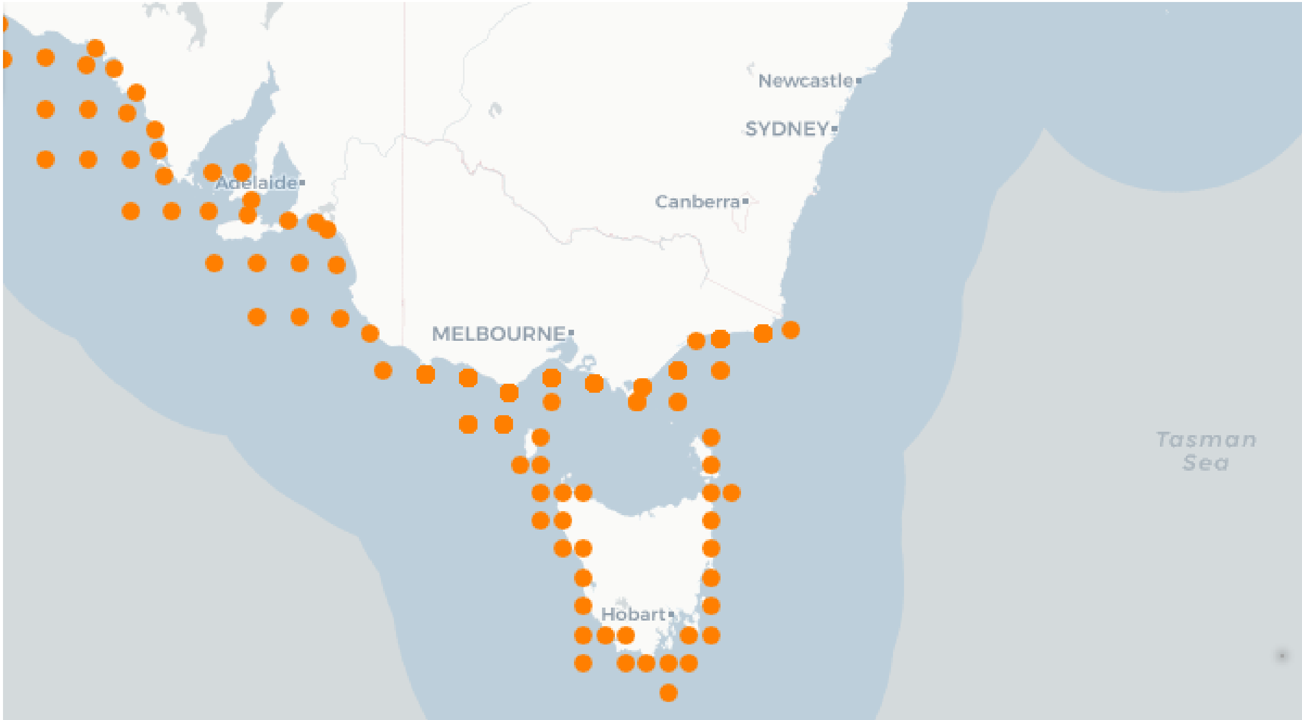
SRL grow by moulting or shedding their exoskeleton. Juvenile lobsters moult approximately 5 times year, declining to once a year for mature adults. Research on temporal moulting patterns in adult SRL in Tasmanian waters including King Island (Gardner and Mills 2013), which tracked over 4,000 tagged individuals, found females mainly moult between February and May while males moult mainly in August and September with the greater majority moulting in August. The Tasmanian Seafood Industry Council (TSIC) advised that moulting for adult males occurs in September and October. Males grow faster and larger than females, reaching 160 mm in carapace length after ten years. Females generally reach 120 mm in the same period. Growth rates also vary spatially, with growth faster in the east than in the west (DPI 2009). It can take between 3 and 10 years for SRL to reach commercial fishing size (SRL 2021).

Although rock lobsters have no formal protection under Australian law, Hayes et al. (2021) identified key natural values for the South-East marine park network. The key natural values were identified by subject matter experts using a set of criteria developed from the criteria used to identify equivalent or similar concepts in other national and international contexts. Each key natural value is allocated to an ecosystem within the common language and thereby mapped.

The SRL does not have an EPBC status or associated recovery or management plan. While there is little scientific data on the population, stock status records indicate that the southern Australian stock is sustainable (Linnane et al. 2021). However, the stock status is only marginally above the limit reference point for egg production. The populations of SRL in the north-west of Tasmania are characterised by larger individuals and faster growth than much of the rest of the state. The Tasmanian stock assessment area that incorporates King Island and part of the AMP has the second lowest biomass in Tasmania, as well as the lowest egg production in the state (Hartmann 2022).

Surveys of commercial fishers operating in and around the ZMP, as well as analysing commercial rock lobster catch data in the region, identified that most of the fishing reported occurred in waters closer to King Island than the marine park offshore (UTAS 2023). Surveys also identified that the aggregate catches recorded in fishery reporting blocks overlapping the ZMP were low relative to other areas, implying an overall low population density within the park. A review of catch data showed that catch in tonnes appears to have remained steady since 2008 for both the Tasmanian and Victorian fishing blocks.

Pressures on SRL populations include fishing, climate change, with respect to declining individual performance with warming, potential future competition with conspecific lobsters, and future interactions with the range-extending destructive sea urchin (UTAS 2023).



Source: Linnane et al. 2021

Figure 4-28: Distribution of reported commercial catch of SRL

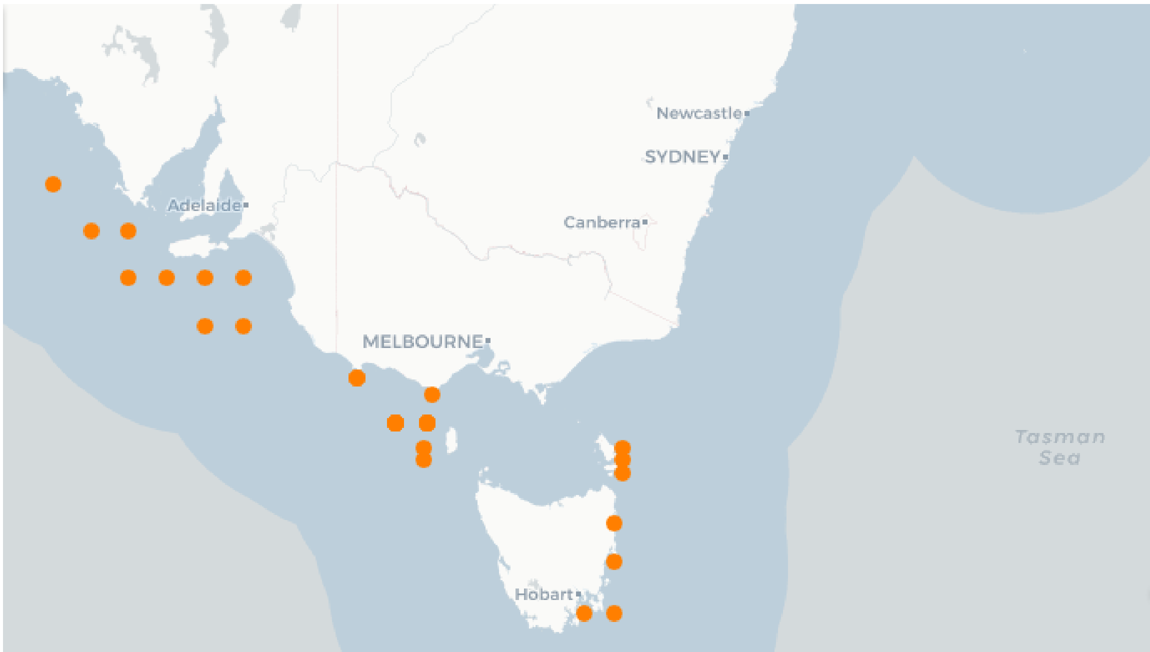
The **giant crab** (*Pseudocarcinus gigas*) is a commercially important species in the region that is endemic to the waters of southern Australia (DoE 2014b) (Figure 4-29). This species resides on muddy or rocky bottoms in waters of the Southern Ocean at depths from 18 to 600 m depth (Gardner and Welsford 2003, Poore 2004, Heeren and Mitchell 1997). Most commonly this species is found in the shelf break habitat associated with bryozoan substrates between 140 m and 270 m (Poor 2004, Leon et al. 2017). The habitat of early juveniles has yet to be established, however there is some evidence that smaller individuals occur in deeper water (Williams et al 2009; Leon unpublished data). Additionally, bryozoan communities are rich in prey items suitable for juvenile crabs, suggesting that this particular habitat is likely to be important for the settlement and growth of P. gigas (Levings 2001). Williams et al. (2009) notes that giant crabs observed during surveys along the continental slope were using ledges and sponges for shelter. Given its habitat preferences and mapped fishing activity (edge of the continental slope), giant crabs are known to be present in the shelf slope of the operational areas.

The species feeds on carrion and slow-moving benthic species including gastropods, crustaceans and starfish. They breed in June and July, and the female carry up to two million eggs for approximately four months. As hatching approaches (October to November), females are thought to migrate to the shelf-break (Currie and Ward 2009). Upon hatching, the larval duration is around 50 days with larvae release occurring at the edge of the continental shelf (FRDC 2017). There is a strong capacity for larval dispersal over large spatial scales prior to settlement (PIRSA 2002). Recruitment is not distributed evenly, with some areas having higher juvenile abundance than others, which is not a function of habitat but larval drift and ocean current movements (FRDC 2018a). Oceanographic modelling has demonstrated the species is of a single biological stock with larval dispersal occurring along the edge of the continental shelf and drifting with plankton for a 50-day period.

Female moulting peaks strongly in winter (June and July). Males moult in summer (November and December). Intermoult period estimates varied from 3 to 4 years for juvenile males and females, with rapid lengthening in time between moulting events to approximately 7 years for females and 4.5 years for males. Gardner (1998) reports that females appear to mate while soft-shelled with stored sperm remaining viable for at least 4 years; broods are produced annually although females occasionally skip a reproductive season, which may be associated with moulting, and several broods may be produced between moults although fecundity declines with successive broods.

The species key biological features (e.g., long-lived, slow growing) have the potential to leave the population vulnerable to decline (FRDC 2018a). While there is little scientific data on the population, stock status records show the species to be sustainable throughout WA, SA and Victoria but depleted in Tasmania (Hartmann et al. 2021). However, the giant crab does not have EPBC status or an associated recovery or management plan. There are a range of anthropogenic threats that affect giant crabs including:

- Commercial and recreational fishing, and
- Ecosystem effects as a result of habitat modification and climate change.



Source: Hartmann et al. 2021

Figure 4-29: Distribution of reported commercial catch of giant crab

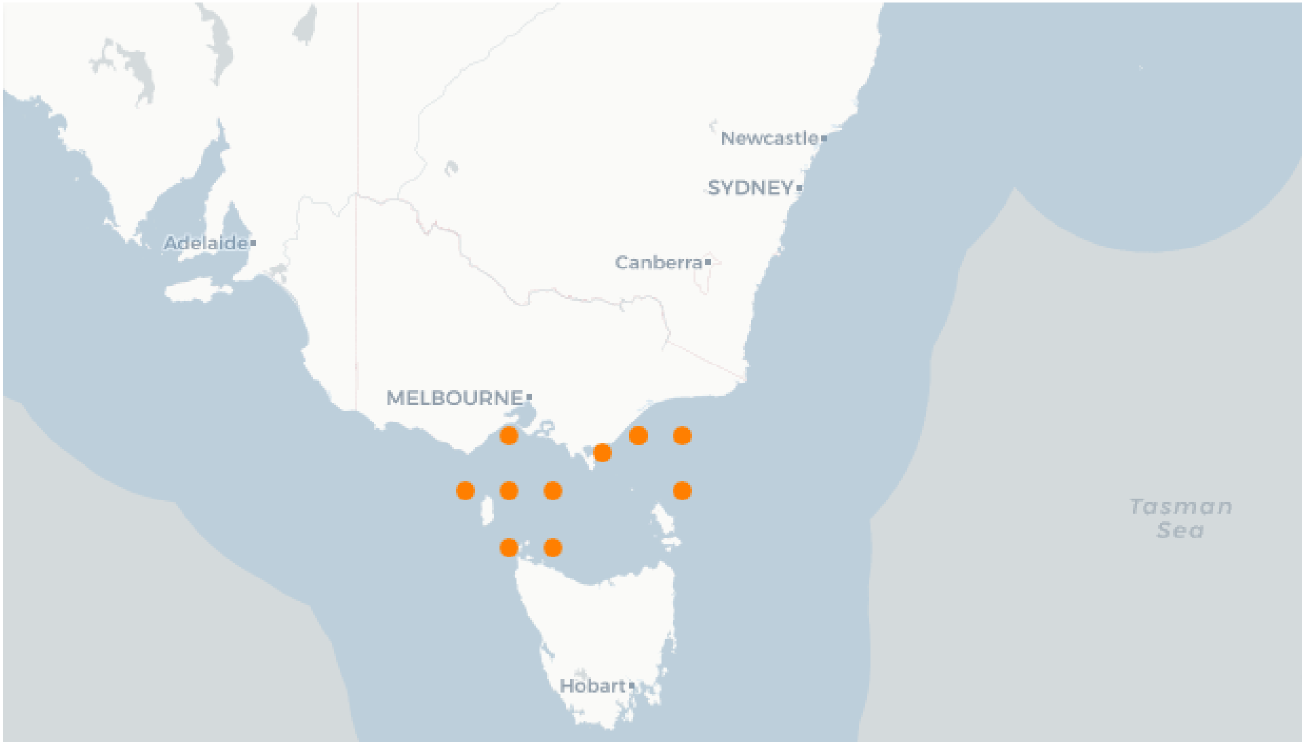
4.6.4.3. Bivalves

Bivalves belong to phylum Mollusca and include oysters, mussels, pipis, scallops, cockles and clams. Bivalves are laterally compressed and have soft body parts which are enclosed by a two-part hinged shell secreted by a mantle. They are filter feeders that feed primarily on phytoplankton. Some bivalves attach to hard substrates while others burrow in the soft sediment. There are two species of commercial significance that are fished in blocks that overlap the operational areas and are considered likely to be present within the EMBA.

Commercial scallops (*Pecten fumatus*) are a commercially important species that can be distinguished from other scallops by their equal-sized circular shaped shells. This species is distributed throughout southern Australia, from mid NSW to mid-WA including Tasmania in depths between 1-120 m. Scallops are typically sedentary benthic organisms that aggregate into beds and can be found buried in soft sediment (mud and sand). Spawning is known to only occur after a two-year development period and is thought to be triggered by an increase in temperature. Commercial scallops can release up to one million eggs into the water column during spawning.

There are four commercial scallop stocks in Australia: Bass Strait Central Zone Scallop Fishery, the Port Phillip Bay Dive Scallop Fishery, the Tasmanian Scallop Fishery and Victoria's Ocean Scallop Fishery. Stock status records show the species to be sustainable through the Commonwealth and Port Phillip Bay jurisdictions, while stocks are considered depleted in the Tasmanian and Victorian Fisheries jurisdictions (Semmens and Woodhams 2021). However, since being closed in 2015 due to low stock the Tasmanian Scallop Fishery was approved to reopen in September of 2021 and has continued on with the 2022 season. Figure 4-30 shows the distribution of reported commercial catch of commercial scallop in south-eastern Australia (Semmens and Woodhams 2021) which indicates it is likely to be present in the EMBA. Although, the commercial scallop does not have EPBC status or an associated recovery or management plan, there are a range of anthropogenic threats that have the potential to affect commercial scallops including:

- Commercial and recreational fishing, and
- Climate change (i.e. ocean acidification).



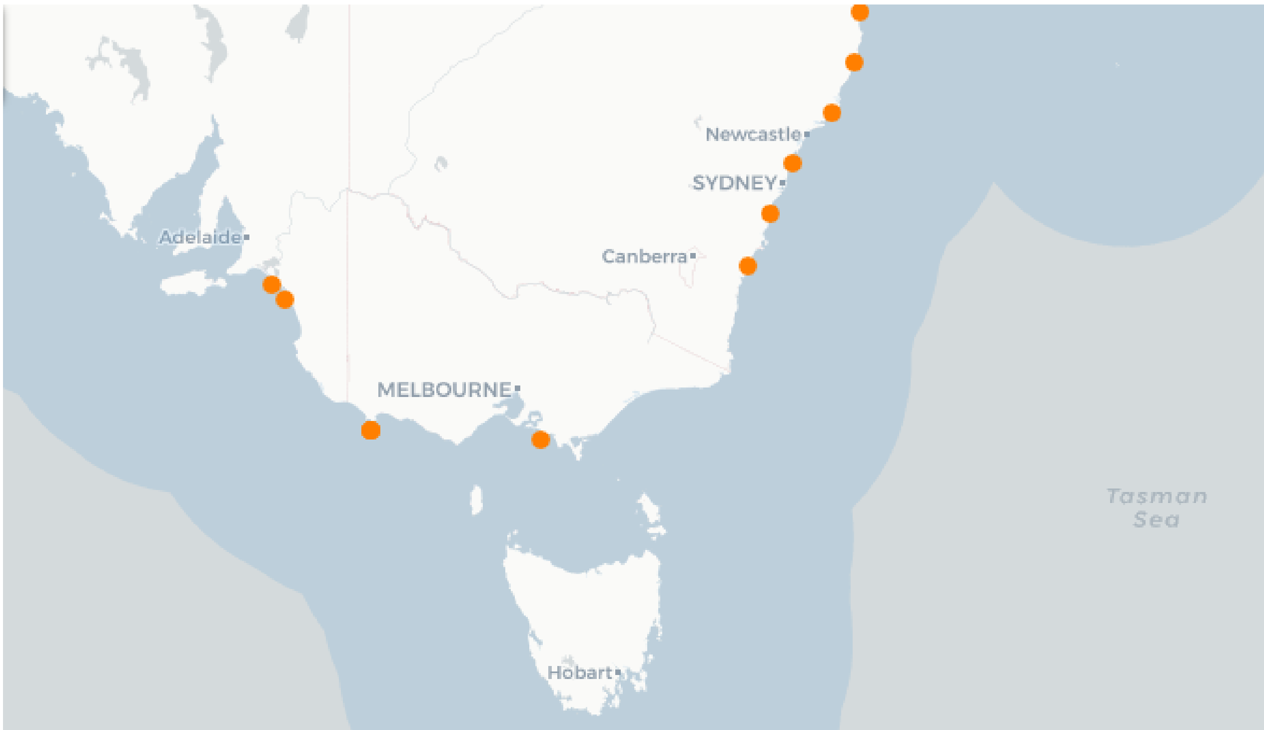
Source: Semmens and Woodhams (2021)

Figure 4-30: Distribution of reported commercial catch of commercial scallop

Pipi (*Donax deltoides*) are a commercially important species found on sandy beaches between southern QLD and Murray River in SA and have been a culturally important species to First Nations people for thousands of years. Life expectancy for this species is between 4-5 years and like most bivalves this species filter feeds by extracting microscopic matter from the water column (Ferguson and Johnson 2021). Typically, pipi reach sexual maturity towards the end of their first year and are then able to spawn year-round. East Australian and South Australian currents act as key drivers of gene flow on the east and south coasts of Australia which has resulted in high genetic variation between populations on either side of Bass Strait (Ferguson and Johnson 2021).

Stock status records show the species to be sustainable through the NSW and SA jurisdiction while the Victorian jurisdiction is undefined. Figure 4-31 shows the distribution of reported commercial catch of pipi in south-eastern Australia (Ferguson and Johnson 2021) which indicates it is likely that they will be present in the EMBA. Although, pipi does not have EPBC status or an associated recovery or management plan, there are a range of anthropogenic threats that have the potential to affect them. Key threats identified include:

- Commercial and recreational fishing, and
- Climate change.



Source: Ferguson and Johnson 2021

Figure 4-31: Distribution of reported commercial catch of pipi

4.6.4.4. Gastropods

Gastropods belong to phylum Mollusca and include snails, slugs, cone shells, abalones and periwinkles. Gastropods are extremely diverse in size, body and shell morphology as well as in their feeding habits. This class is specifically characterised by the possession of a single shell (often coiled) although it is lost in some slug groups. Typical means of locomotion is crawling through the utilisation of a muscular foot, however in some species it is modified for burrowing, leaping or swimming depending on species life-style characteristics. There is one genus of commercial significance, Haliotis (Abalone), that is fished in blocks within the EMBA.

Blacklip abalone (*Haliotis rubra rubra*) and **greenlip abalone** (*Haliotis laevigata*) are commercially important reef-dwelling species widely distributed across tropical and temperate coastal areas. Abalone are single shelled with a fleshy body and muscular foot which they use to attach to hard substrate, typically in water depths of 5-10 m however they can be found in depths up to 40 m (DPI 2024). A distinguishing feature of this genus is their rows of small holes or 'pores' along the edge of their shells where the organism will expel water that has passed through its gills (DPIRD 2016). Females produce and release millions of eggs each year into the water column, where they are fertilised by sperm released by males. Fertilised eggs hatch into larvae and after about a week the larvae develop into small juveniles which settle onto rocks (DPIRD 2016). After settlement, juvenile abalone hide under rocks during the day only emerging in the night to feed. Once abalone reach sexual maturity (approximately 5-8 years old) most animals no longer engage in this behaviour becoming sedentary, rarely moving more than a few 100 m from their natal site (DNRET 2022j). Evidence confirms that the greenlip abalone comprises numerous independent biological stocks at a spatially broad scale, even larger than the biological stock structure of the blacklip abalone (Mayfield et al. 2021). [Paragraph updated in response to Matters: F13 and F16].

Stock status records show the blacklip abalone to be sustainable in 2 of 3 South Australian stocks and in 3 of 4 Tasmanian stocks. Of the remaining 5 stocks 4 are determined to be depleted (SA, TAS, VIC) and the last is undefined (NSW). Stock status records show the greenlip abalone to be depleted in 3 stocks (SA, TAS) and undefined in 3 stocks (VIC, SA). Figure 4-32 and Figure 4-33 show the distribution of reported commercial catch of both species in south-eastern Australia (Mundy et al. 2021; Mayfield et al. 2021) which indicates that they are likely to be present in the EMBA. Although neither abalone species have EPBC status or an associated recovery or management plans, there are a range of anthropogenic threats that have the potential to affect them including commercial and recreational fishing, and climate change (i.e. ocean acidification). During consultation it was identified that Victorian stocks are at risk of a herpes-like virus that tends to reappear when abalone are under stress (Org ID: 580, Abalone Council Victoria, Org ID: 588, Western Abalone Divers Association, Event ID: 4131, FB ID: 446).

Source: Mundy et al. 2021

Figure 4-32: Distribution of reported commercial catch of blacklip abalone

Source: Mayfield et al. 2021

Figure 4-33: Distribution of reported commercial catch of greenlip abalone

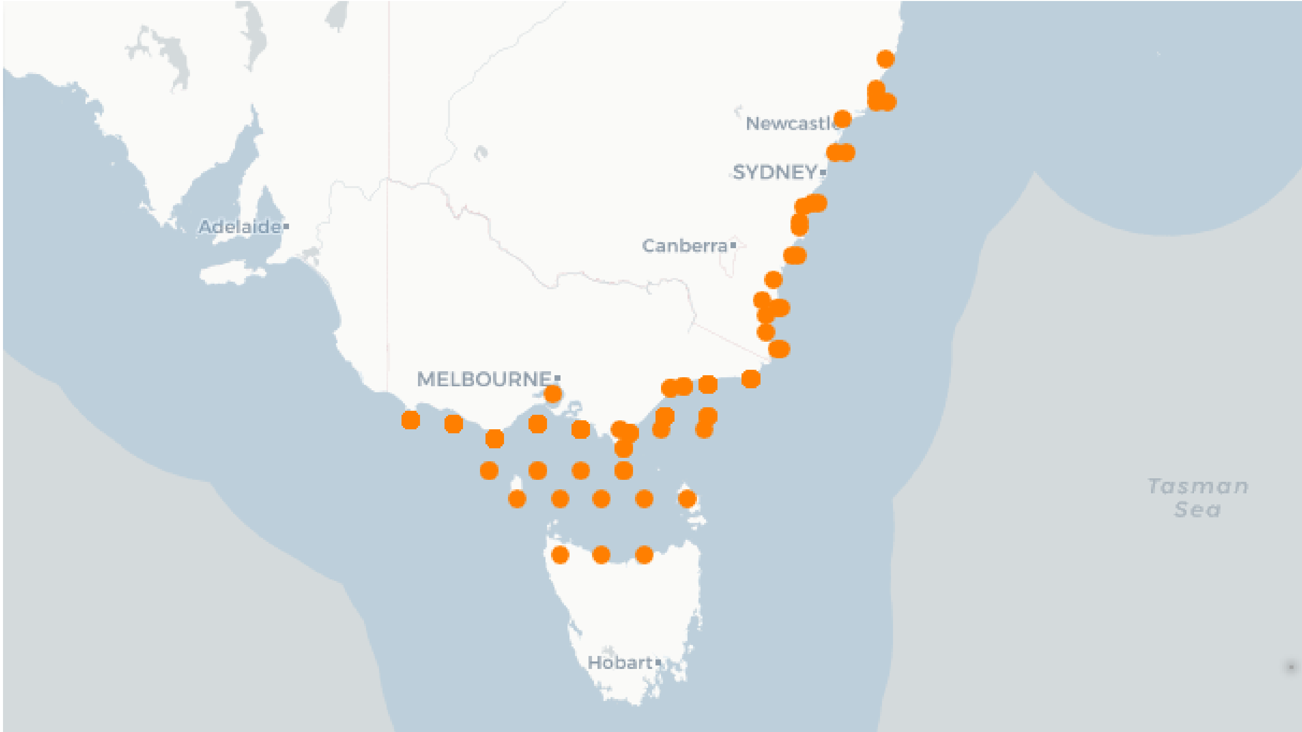
4.6.4.5. Cephalopods

Cephalopods belong to phylum Mollusca and include squid, octopus, cuttlefish and nautilus. Cephalopods have a very broad distribution throughout southern Australian waters and are known to inhabit coastal and shelf environments, canyon systems and deep waters off the continental shelf (Boyle and Rodhurst 2005). They are active mobile predators who feed mostly on fish and crustaceans living on or near the seabed (Boyle and Rodhurst 2005). Cephalopods have a high growth rate with a short life span and reproduce sexually (Boyle and Rodhurst 2005). The individual size and number of eggs (released in a jelly like egg mass) during a reproductive season is variable and ranges from a few large eggs (< 30 mm long) attached to the seabed to numerous (>1 million) small eggs drifting in the plankton. The incubation period is highly temperature dependent and is completed with the hatching of the larval stage which resembles a miniature adult. After breeding the adult dies within a short time and in species with a highly synchronised breeding population this can result in conspicuous mass mortality (Boyle and Rodhurst 2005). There are two species of commercial significance that are fished in blocks overlapping the EMBA.

The **pale octopus** (*Octopus pallidus*) is a commercially important species found across the Great Australian Bight around Tasmania and towards southern NSW. They can be found inhabiting sand and mud substrates, often in association with sponge gardens or beds of large solitary sea squirts in depths up to 600 m (Atlas of Australia 2022a). This species hides during the day and feeds at night primarily on bivalves, which are pulled apart or drilled. The pale octopus lays large eggs that are attached to hard substrates and foraging begins immediately after hatching. Evidence suggests that there are a number of subpopulations within the Bass Strait due to limited species dispersal and isolation due to distance (Krueck et al. 2021).

Stock status records show the species to be depleting in the Tasmanian jurisdiction, undefined in the Victorian jurisdiction and negligible in both SA and NSW due to historically low catch rates. Figure 4-34 shows the distribution of reported commercial catch of pale octopus in south-eastern Australia (Krueck et al. 2021) which indicates it is likely that they will be present within the EMBA. Although, the pale octopus does not have EPBC status or an associated recovery or management plan, there are a range of anthropogenic threats that have the potential to affect them. Key threats identified include:

- Commercial and recreational fishing, and
- Climate change.



Source: Krueck et al. 2021

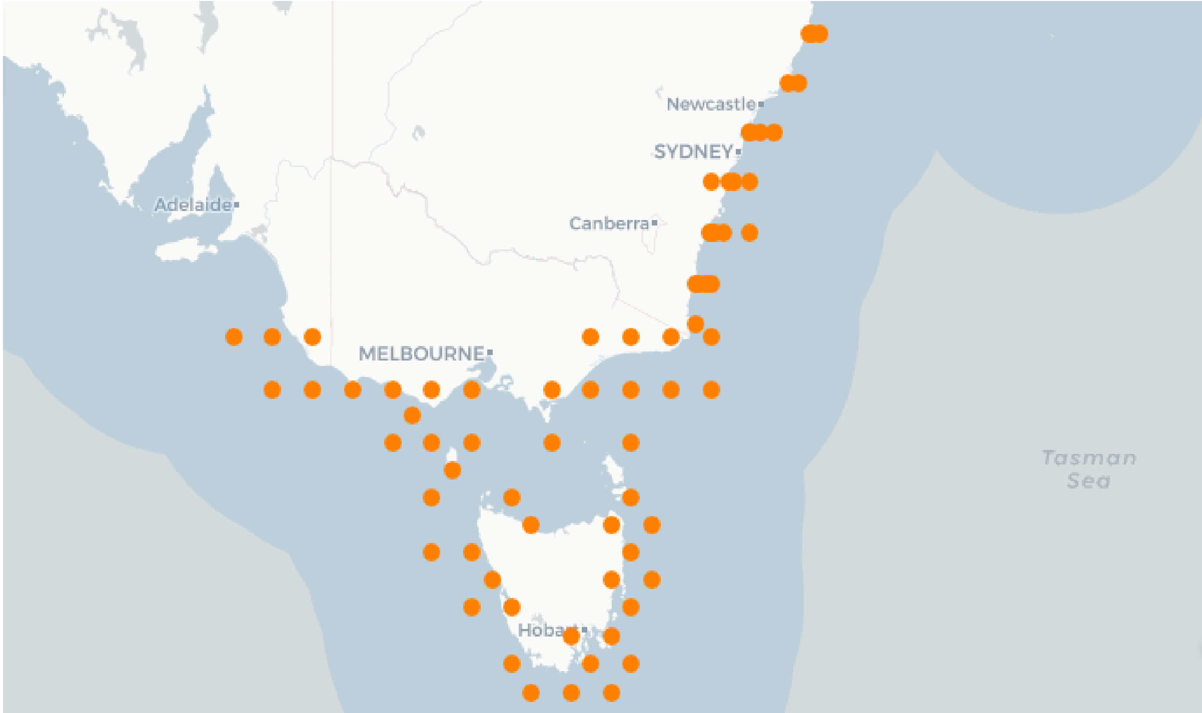
Figure 4-34: Distribution of reported commercial catch of pale octopus

Gould's squid (*Nototodarus gouldi*) are a commercially important species typically found at depths from 50 – 200 m off the subtropical and temperate coasts of Australia (Atlas of Living Australia 2022b). Gould's squid feed on crustaceans, fish and cephalopods at night and in turn are prey for birds, large fish, sharks and marine mammals (O'Sullivan and Cullen 1983). Gould's squid are short lived (less than one year), spawn multiple times during their life cycle, and display highly variable growth rates, size and age at maturity (Jackson and McGrath-Steer 2003).

Noriega et al (2021) highlights characteristics of the Gould's squid's lifecycle which lend itself to rapid increases in biomass during favourable environmental conditions, making it less susceptible to becoming overfished than longer-lived species. The species is commercially harvested and the population size in Bass Strait varies from year to year. This is primarily due to its short life cycle, the 'boom and bust' nature of its population dynamics and life history characteristics. Figure 4-35 shows the distribution of reported commercial catch of Gould's squid in south-eastern Australia (Noriega et al. 2021) which indicates it is likely that Gould's squid will be present in the EMBA.

There is no formal stock assessment available for the population, however stock status records show the species in south-eastern Australia to be of a sustainable level (Noriega et al. 2021). However, there are a range of anthropogenic threats that affect the population including:

- Commercial and recreational fishing, and
- Ecosystem effects as a result of habitat modification and climate change.



Source: Noriega et al. 2021

Figure 4-35: Distribution of reported commercial catch of Gould's squid

4.6.5. Fish

Fishes are the largest and most diverse group of vertebrate fauna. The term fishes include the primitive jawless fish (hagfishes and lampreys), cartilaginous fish (sharks, rays and chimaeras), and the many and diverse groups of bony fishes (Bray and Gorman 2018). Fish habitats in Australia are varied and may include coral or rocky reefs, estuaries, and oceanic and deep-sea habitats beyond the continental slope. Almost a quarter of Australia's fishes are endemic, with 60% of these species living in the cooler southern waters (Hoese et al. 2006). Some fish species are listed as threatened and/or migratory under the EPBC Act 1999, and these are considered a matter of national environmental significance. Species may also be protected under state (and territory) environmental legislation.

Multiple species (or species habitat) of fish may occur within the EMBA. Table 4-7 identifies the presence and protection status of species for each EMBA for T/49P and VIC/P79 (northern and southern extents). PMST records identified 63 fish species protected under the EPBC Act potentially occurring in the EMBA. This includes 20 species listed as threatened, 6 species listed as migratory and a further 40 listed marine species, all of which are Sygnathiformes (seahorses, pipefishes and their relatives).

The EPBC Act PMST report also identified that BIAs for the white shark (*Carcharodon carcharias*) and the grey nurse shark (*Carchariasmo taurus* (east coast population)) overlap the EMBA as displayed in Figure 4-36 and Figure 4-37.

Table 4-7: Fish species that may occur within relevant EMBAs, and protection status

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Sound EMBA <2 Km	MDO (Mod)	MDO (Low)	LOWC (Mod)	EMBA	EPBC Management Plan
Carcharodon carcharias	White shark, Great white shark	V	✓	-	KO^{T} FKO^{VN} KO^{VS}	KO^{T} FKO^{VN} KO^{VS}	FKO	BKO	BKO	BKO	Recovery Plan for the White Shark (*Carcharodon carcharias*)
Centrophorus zeehaani	Southern dogfish, Endeavour dogfish, Little gulper shark	CD	-	-	LO	LO	LO	LO	LO	LO	-
Galeorhinus galeus	School shark, Eastern school shark, Snapper shark, Tope, Soupfin shark	CD	-	-	MO	MO	LO	LO	LO	LO	-
Isurus oxyrinchus	Shortfin mako, Mako shark	-	✓	-	LO	LO	LO	LO	LO	LO	-
Lamna nasus	Porbeagle, Mackerel shark	-	✓	-	LO	LO	LO	LO	LO	LO	-
Carcharhinus longimanus	Oceanic whitetip shark	-	✓	-	-	-	-	MO	MO	MO	-
Carchariasmo taurus (east coast population)	Grey nurse shark (east coast population)	CE	-	-	-	-	-	LO^{T} LO^{VS}	KO^{T} LO^{VS} MO^{VN}	KO	Recovery Plan for the Grey Nurse Shark (Carcharias taurus)
Centrophorus harrissoni	Harrisson's dogfish, Endeavour dogfish, Dumb gulper shark, Harrison's deepsea dogfish	CD	-	-	-	-	-	LO	LO	LO	-
Mobula birostris	Giant manta ray	-	✓	-	-	-	-	-	KO^{T}	KO	-
Rhincodon typus	Whale shark	V	✓	-	-	-	-	MO	MO	MO	Conservation Advice Rhincodon typus whale shark
Zearaja maugeana	Maugean skate, Port Davey skate	E	-	-	-	-	-	KO^{T}	KO^{T}	KO	Approved Conservation Advice for Raja sp. L (Maugean Skate)
Hoplostethus atlanticus	Orange roughy, Deep-sea perch, Red roughy	CD	-	-	LO	LO	LO	LO	LO	LO	-
Prototroctes maraena	Australian grayling	V	-	-	MO^{T} MO^{VN}	MO^{T} MO^{VN}	KO	KO	KO	KO	National Recovery Plan for Australian Grayling *Prototroctes maraena*
Seriolella brama	Blue warehou	CD	-	-	KO	KO	KO	KO	KO	KO	Listing Advice *Seriolella brama* blue warehou
Thunnus maccoyii	Southern bluefin tuna	CD	-	-	LO	LO	LO	LO	LO	LO	Listing Advice on *Thunnus maccoyii* (Southern Bluefin Tuna)
Epinephelus daemelii	Black rockcod, black cod, Saddled rockcod	V	-	-	-	-	-	MO^{T} MO^{VS}	LO^{T} MO^{VS}	LO	Approved Conservation Advice for *Epinephelus daemelii* (black cod)
Nannoperca obscura	Yarra pygmy perch	E	-	-	-	-	MO^{T} MO^{VS} KO^{VN}	KO	KO	KO	National Recovery Plan for the Yarra Pygmy Perch (*Nannoperca obscura*) Conservation Advice for *Nannoperca obscura* (Yarra pygmy perch)
Rexea solandri (eastern Australian population)	Eastern gemfish	CD	-	-	-	-	LO^{T}	LO	LO	LO	-
Brachionichthys hirsutus	Spotted handfish	CE	-	-	-	-	-	-	-	MO^{T}	Recovery Plan for Three Handfish Species
Brachiopsilus ziebelli	Ziebell's handfish, Waterfall Bay handfish	V	-	-	-	-	-	-	-	LO^{T} LO^{VN}	Recovery Plan for Three Handfish Species
Nannoperca variegata	Variegated pygmy perch, Ewens pygmy perch, Golden pygmy perch	V	-	-	-	-	-	KO^{VN}	KO^{VN}	LO^{T} KO^{VS} KO^{VN}	National recovery plan for the Variegated Pygmy Perch (*Nannoperca variegate*)
Thymichthys politus	Red handfish	CE	-	-	-	-	-	MO^{T}	MO^{T}	MO	Recovery Plan for Three Handfish Species
Acentronura australe	Southern pygmy pipehorse	-	-	✓	-	-	-	MO^{VN}	MO^{VS} MO^{VN}	MO	-
Acentronura tentaculata	Shortpouch pygmy pipehorse	-	-	✓	-	-	-	-	MO^{T}	MO	-
Campichthys galei	Gale's pipefish	-	-	✓	-	-	-	-	-	MO^{VN}	-
Campichthys tryoni	Tryon's pipefish	-	-	✓	-	-	-	MO^{VN}	MO^{VS} MO^{VN}	MO	-
Cosmocampus howensis	Lord Howe pipefish	-	-	✓	-	-	-	-	MO^{T}	MO	-
Filicampus tigris	Tiger Pipefish	-	-	✓	-	-	-	-	-	MO^{VN}	-
Heraldia nocturna	Upside-down pipefish, Eastern upside-down pipefish, Eastern upside-down pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Hippocampus abdominalis	Big-belly seahorse, Eastern potbelly seahorse, New Zealand potbelly seahorse	-	-	✓	MO	MO	MO	MO	MO	MO	-
Hippocampus breviceps	Short-head seahorse, Short-snouted seahorse	-	-	✓	MO	MO	MO	MO	MO	MO	-
Hippocampus minotaur	Bullneck seahorse	-	-	✓	MO^{T}	MO^{T}	MO	MO	MO	MO	-

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Sound EMBA <2 Km	MDO (Mod)	MDO (Low)	LOWC (Mod)	EMBA	EPBC Management Plan
Hippocampus whitei	White's seahorse, Crowned seahorse, Sydney seahorse	E	-	✓	-	-	-	-	-	KO^{T} KO^{VS}	Conservation Advice *Hippocampus whitei* White's Seahorse
Histiogamphelus briggsii	Crested pipefish, Briggs' crested pipefish, Briggs' pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Histiogamphelus cristatus	Rhino pipefish, Macleay's crested pipefish, Ring-back pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Hypselognathus horridus	Shaggy Pipefish, Prickly Pipefish	-	-	✓	-	-	-	-	-	MO^{VN}	-
Hypselognathus rostratus	Knifesnout pipefish, Knife-snouted pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Kaupus costatus	Deepbody pipefish, Deep-bodied pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Kimblaeus bassensis	Trawl pipefish, Bass Strait pipefish	-	-	✓	MO^{T}	MO^{T}	MO	MO	MO	MO	-
Leptoichthys fistularius	Brushtail pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Lissocampus caudalis	Australian smooth pipefish, Smooth pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Lissocampus runa	Javelin pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Maroubra perserrata	Sawtooth pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Mitotichthys mollisoni	Mollison's pipefish	-	-	✓	-	-	MO	MO	MO	MO	-
Mitotichthys semistriatus	Halfbanded pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Mitotichthys tuckeri	Tucker's pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Notiocampus ruber	Red pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Phycodurus eques	Leafy seadragon	-	-	✓	MO	MO	MO	MO	MO	MO	-
Phyllopteryx taeniolatus	Common seadragon, Weedy seadragon	-	-	✓	MO	MO	MO	MO	MO	MO	-
Pugnaso curtirostris	Pugnose pipefish, Pug-nosed pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Solegnathus robustus	Robust pipehorse, Robust spiny pipehorse	-	-	✓	MO	MO	MO	MO	MO	MO	-
Solegnathus spinosissimus	Spiny pipehorse, Australian spiny pipehorse	-	-	✓	MO	MO	MO	MO	MO	MO	-
Solenostomus cyanopterus	Robust ghostpipefish, Blue-finned ghost pipefish	-	-	✓	-	-	-	-	MO^{T}	MO	-
Stigmatopora argus	Spotted pipefish, Gulf pipefish, Peacock pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Stigmatopora nigra	Widebody pipefish, Wide-bodied pipefish, Black pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Stipecampus cristatus	Ringback pipefish, Ring-backed pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Syngnathoides biaculeatus	Double-end pipehorse, Double-ended pipehorse, Alligator pipefish	-	-	✓	-	-	-	MO	MO	MO	-
Urocampus carinirostris	Hairy pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Vanacampus margaritifer	Mother-of-pearl pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Vanacampus phillipi	Port Phillip pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Vanacampus poecilolaemus	Longsnout pipefish, Australian long-snout pipefish, Long-snouted pipefish	-	-	✓	MO	MO	MO	MO	MO	MO	-
Vanacampus vercoi	Verco's pipefish	-	-	✓	-	-	-	MO^{VN}	MO^{VS} MO^{VN}	MO	-

Threatened Species: CD – Conservation Dependent V – Vulnerable E – Endangered CE – Critically Endangered	Type of presence: MO – Species or species habitat that may occur within the area LO – Species or species habitat likely to occur within area KO – Species or species habitat known to occur within area FKO – Foraging, feeding or related behaviour known to occur within area BKO – Breeding known to occur within area	Operational Area: T – T/49P VS – VIC/P79 Southern extent VN – VIC/P79 Northern extent [Table updated in response to Matter: I06].

Table 4-8: Fish biologically important areas (BIAS) in relation to EMBAs

Scientific Name	Common Name	Operational Area	Sound EMBA (<2 km)	MDO (mod)	MDO (low)	LOWC (mod)	EMBA
Carcharodon carcharias	White shark, Great white shark	F^{VN} D	F^{VN} D	F D	F D B$^{T, VS}$	F D B	F D B
Carchariasmo taurus (east coast population)	Grey nurse shark (east coast population)	-	-	-	F$^{T, VS}$ M$^{T, VS}$	F$^{T, VS}$ M$^{T, VS}$	F, M

Biologically Important Areas: (B) – Breeding (F) – Foraging (D) – Distribution (M) – Migration	Operational Areas: T – T/49P VS – VIC/P79 Southern extent VN – VIC/P79 Northern extent

4.6.5.1. Sharks

Sharks belong to Class Chondrichthyes which includes sharks, rays and chimeras. They are found throughout marine habitats worldwide dominating the upper trophic levels. According to IUCN Red List criteria, 32.6% of species within Class Chondrichthyes are threatened with extinction with more than one-third estimated to be threatened if applied to data deficient species (Dulvy et al. 2021). Australia contains 331 species that belong to Class Chondrichthyes, 183 are sharks, a large portion of which are endemic to Australian waters (FRDC 2023). Five of the 331 species are listed as critically endangered, 13 as endangered and 20 as vulnerable (FRDC 2023). Apart from the ecosystem benefits these species provide social, economic and cultural values such as commercial fishing, tourism opportunities and cultural traditions. However, anthropogenic threats such as overfishing (the sole threat for 67.3% of species), loss and degradation of habitat, climate change and pollution have resulted in the depletion of these species (Dulvy et al. 2021). Shark species discussed below are EPBC listed threatened species with BIAs within the EMBA. [Paragraph added in response to Matter: F04].

The **white shark** (*Carcharodon carcharias*) (EPBC Act: Vulnerable, Migratory) is widely distributed throughout temperate and sub-tropical regions in the northern and southern hemispheres. It is a highly mobile species, primarily found in coastal and offshore areas of the continental shelf and islands, however, has been seen diving to depths up to 1,000 m (DoE 2022). They have been recorded making excursions into the open ocean and across ocean basins with exchange between Australia, South Africa and New Zealand (DoE 2022). White sharks are generally observed between the coast and the 100 m depth contour (Bruce et al. 2006) with areas of frequent encounter around seal colonies (DoE 2022). There is a strong correlation between white shark distribution and the location of seal colonies due to the importance of seals as the primary prey for large white sharks. Australian fur-seal colonies known to occur within the EMBA include Lady Julia Percy Island (Vic), Reid Rocks (Tas) and Seal Rocks (Vic) (Shaughnessy 1999). New Zealand fur-seal colonies within the EMBA occur at Cape Bridgewater (Vic), Lady Julia Percy Island (Vic), Kanowna Island (Vic) and Maatsuyker Island (Tas) (Kirkwood et al. 2009).

The white shark feeds on a variety of prey aside from pinnipeds, including fish, other sharks and rays, marine mammals, squid and crustaceans (DoE 2022). Recent studies have found that the energy requirements of adult white sharks may be several times higher than previously estimated, and that seasonal feeding on seal colonies is important in meeting these energy needs (DoE 2022). The South-West Commonwealth Marine Reserves Network Management Plan 2013 – 2023 (DNP 2013) recognises that white sharks forage in the Apollo and Zeehan Commonwealth Marine Reserves. This foraging BIA overlaps the EMBA and the operational area of VIC/P79 in the northern extent (Figure 4-36).

The **grey nurse shark** (*Carchariasmo taurus (east coast population))* (EPBC Act: Critically Endangered) is widespread in most sub-tropical and cool temperate seas on the continental shelf, with separate east coast and west coast populations (DoE 2014). The east coast population extends from central Queensland to southern NSW, occasionally as far south as the NSW/Victoria border. Preferred habitat for grey nurse sharks is inshore rocky reefs or islands, generally aggregating near the seabed in water depths of 10 – 40 m in deep sandy or gravel filled gutters, or in rocky caves (DoE 2014). The Recovery Plan for the Grey Nurse Shark identifies 19 key aggregation sites which are considered habitat critical to the survival of the species. No aggregation sites are located within the operational areas or along the Victorian coast, however 2 are located within the EMBA at the Tollgate Islands, NSW and Montague Island, NSW (DoE 2014). Additionally, there are foraging and migration BIAs along the NSW coastline (within the EMBA) which are displayed in (Figure 4-37) (DoE 2014). The grey nurse shark feeds on a variety of bony fish, smaller sharks and rays, squid crabs and lobsters. The species has a gestational period of 9-12 months and females will birth 1 to 2 pups once every 2 years. Recent research shows that the grey nurse shark exhibits reproductive philanthropy meaning they return to specific nursery areas each year (Bray 2020). [Paragraph updated in response to Matter: F02].

The recovery plan for the grey nurse shark identifies primary threats to the species as accidental mortality and injury arising from interactions with commercial and recreational fishing activities and mortality related to shark control activities such as meshing or drum lining (DoE 2014). Secondary threats include ecosystem effects such as pollution, and climate change (including change in sea temperature and ocean acidification) (DoE 2014).

The **whale shark** (*Rhincodon typus*) (EPBC Act: Vulnerable, Migratory) is the world's largest fish and one of only three filter feeding shark species (TSSC 2015a). They have a broad distribution in warm and tropical waters of the world, and in Australia are only known to occur on the west coast of WA, however isolated records exist of whale sharks off NSW, Victoria and SA (TSSC 2015a). Each year there is a documented feeding aggregation that occurs off the Ningaloo Reef between March and July (TSSC 2015a). The primary threats to whale sharks include boat strike from large vessels and habitat disruption from mineral exploration, production and transportation. Further minor threats include marine debris and climate change (TSSC 2015a). However, the species is not known to migrate through Bass Strait, and it is highly unlikely to occur within the EMBA.

4.6.5.2. Fish

Fish species discussed below are either EPBC listed as critically endangered, meaning they are facing a high risk of extinction in the wild or have been included as a result of consultation.

The **Australian grayling's** (*Prototroctes Maraena*) (EPBC Act: Vulnerable) range extends from Sydney south along the coast to Victoria and Tasmania. The Australian grayling is a diadromous, migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, and freshwater rivers and streams as adults (TSSC 2021b). Adults migrate downstream to spawn (late summer to winter); eggs are laid and hatch after 10-20 days. Free swimming larvae emerge and are swept downstream into marine habitats by river flow where they stay for approximately 6 months (TSSC 2021b). Juveniles then return to the freshwater environment (approximately around November) where they remain for the remainder of their lives (DoE 2024). Major threats to the Australian Grayling include habitat loss and fragmentation resulting from fish passage barriers, altered hydrology, sedimentation and poor water quality and changes to coastal morphology (TSSC 2021b). [Paragraph added in response to Matter: F05].

The **spotted handfish** (*Brachionichthys hirsutus*) (EPBC Act: Critically Endangered) is endemic to south-eastern Tasmania and are currently found in the Derwent Estuary (northern Tasmania) and adjacent areas. Their range once extended along the east coast of Tasmania however recent studies suggest the majority of the species now persist as small, fragmented populations within the range (DCCEEW 2015b). The spotted handfish inhabits shallow protected coastal bays with sandy and shelly substrates at depths up to 30 m (DCCEEW 2015b). They are small slow moving benthic fish that use their fins to crawl across the sea floor and have a diet consumed of small crustaceans and polychaete worms, small shells and amphipods.

The **red handfish** (*Thymichthys politus*) (EPBC Act: Critically Endangered) is endemic to south-eastern Tasmania and are currently only found in Primrose Sands Reef in Frederick Henry Bay. Due to their rarity, small size, and cryptic nature current population trends are difficult to determine (DCCEEW 2015b). They inhabit a variety of locations, such as on top of rocks, amongst macro-algae, in sandy areas between rocks and reef sand interfaces at depths up to 20 m (DCCEEW 2015b). They are small slow moving benthic fish that use their fins to crawl across the sea floor and have a diet consumed of small crustaceans and polychaete worms.

The recovery plan for three handfish species, including the spotted handfish and the red handfish, identifies primary threats as habitat degradation and waterway pollution. Climate change and bioaccumulation of heavy metals are considered secondary threats. Due to the current population factors such as small population size, fragmented distribution and low dispersal these species have an increased risk of localised extinction as a result of stochastic events (DCCEEW 2015b).

4.6.5.3. Eels

The short-finned eel (*Anguilla australis*) can be found in coastal drainages of eastern Australia, from the Burnett River of southern Queensland, south and westwards to near Mypolonga, Murray River and the Onkaparinga River, South Australia, including the Bass Strait islands and coastal drainages of Tasmania. The species migrates to the sea to spawn and occurs in a wide variety of habitats including streams, lowland rivers, lakes and swamps, preferring still waters with little flow (Gomon and Bray 2022). The short-finned eel is known to eat various types of fish, worms, insects, small crustaceans, molluscs, and water plants and can grow up to 1.1 m long and weigh up to 6.8 kg (VFA 2022b).

Short-finned eels are listed as 'near threatened' on the IUCN red list, with barriers to riverine movement and freshwater habitat loss being key threats. Additionally, changes in ocean currents, primary production, and thermal regimes may also affect eel migration, spawning success, and recruitment (Koster et al. 2021).

The lifecycle of the short-finned eel is not completely understood, spending most of their life in freshwater or estuaries before undergoing a mass migration into the ocean, travelling in excess of 3,000 km to spawn once at an unknown location in the Coral Sea (VFA 2022b). Males generally mature at 8 – 12 years of age, with females maturing at 10 – 20 years. Migration occurs following maturity, and occurs in late summer to autumn, prior to which the eels undergo a series of physical changes to prepare (VFA 2022b). The eels die following spawning, with their larvae then transported southwards along the east coast of Australia where they metamorphose into glass eels and swim into coastal bays and estuaries (VFA 2022b). Most glass eels migrate in the winter and spring (VFA 2022b), although they may continue to arrive anytime throughout the year (VFA 2017a).

Koster et al. (2021) tracked the short-finned eel spawning migration for the first time in Australia. From release along the south-eastern coast of Australia, tagged eels were tracked off the north-eastern coast of Australia, with some individuals recorded near New Caledonia. Koster et al. (2021) reconstructed the oceanic migration routes which showed individual variation with some individuals accessing deep water off the Australian continental shelf swimming directly east through Bass Strait, and others migrating south-east and circumnavigating Tasmania. Based on data from this study, the Operational Areas may overlap some areas where have eel movement has been tracked.

Eels were, and continue to be, an important resource for First Nation communities where they are used for communal gatherings, and in pre-colonial times for barter and trade (VFA 2017a). The Gunditjmara people of south-western VIC built and used sophisticated aquaculture systems throughout the Budj Bim cultural landscape to exploit eel (kooyang) migrations at least 7,000 years ago (see section 4.8.2). These systems and their eel catches have since provided a lasting and sustainable economic and social base for the Gunditjmara society (Koster et al. 2021).

Impacts to eels are assessed in the EP due to the species lifecycle characteristic which expose them to the marine environment and the level of concern about eels, their use and abundance, with this species showing the connections between people, the coastline and the open ocean as eels migrate (NOO 2002b). Information on the Victorian eel fishery can be found in section 4.7.7.5 (Eels Fishery). [Section 4.6.5.3 added in response to Matters: F10 and FN10].

4.6.5.4. Syngnathid

The syngnathids family includes species of seahorses and pipefish. They are found around the world; however, they tend to be most abundant in cold waters. There are around 120 species of syngnathids recorded in Australian waters, 20% of which are endemic (Shokri et al. 2009). Syngnathids are typically associated with shallow water habitats such as seagrass meadows, coral reefs, mangroves, macrophytes and artificial structures as water depth is one of the environmental gradients that govern their patterns of spatial distribution (Hernandez-Urcera et al. 2021). The family typically displays low fecundity, limited distribution and a sedentary nature.

The **White's seahorse** (*Hippocampus whitei*) (EPBC Act: Endangered, Marine) is the only threatened syngnathid species and the only snygnathid know to occur within the EMBA. White's seahorse have a limited Australian distribution as they do not venture into oceanic waters. They can typically be found in shallow waters along the coast of Sydney and Newcastle in estuaries inhabiting seagrasses, sponge gardens and artificial structures (Harasri et al. 2012). In the wild they have been found to live for over five years and begin breeding as early as 7 months typically in long-term monogamous pairs (Harasri et al. 2012). Major threats to the White's seahorse include habitat loss and the cleaning of artificial habitats (TSSC 2020a).

4.6.6. Amphibians

Primarily amphibians are freshwater species that do not exist in the marine environment and are typically intolerant to salt water. However, there are exceptions, and some species are able to survive in brackish waters. Salt tolerance has evolved in over 100 amphibian species world-wide as populations adapt and exploit coastal and inland saline habitats (Hopkins and Brodie 2015). Adaption appears to occur through the exploitation of existing genetic variation in salt tolerance in osmotically stressful and unpredictable environments (Hopkins and Brodie 2015). Some amphibian species are listed as threatened under the EPBC Act 1999, and these are considered a matter of national environmental significance. Species may also be protected under state and territory environmental legislation

The EPBC Act PMST report lists 5 species of amphibians with the potential to occur within the EMBA (Table 4 8; Appendix B). All of the species have an EPBC threatened status, one is endangered and the other 4 are vulnerable. All amphibian species identified by the EPBC Act PMST search were frogs and no BIAs were identified within the relevant EMBAs. Due to the typical terrestrial habitat preference of frogs, it is considered unlikely that they will be affected by offshore activities, however they are considered due to their potential presence along the Victorian, Tasmanian and NSW coasts.

Watson's tree frog (*Litoria watsoni*) (EPBC Act: Endangered) is a medium sized tree frog that is distributed from the Budderoo National Park in south-eastern NSW to the eastern side of the Snowy River National Park in the East Gippsland region of Victoria. The species can be found at elevations from near-sea-level to 1100 m (DAWE 2022c). Recently in Victoria searches have located the species at 31 different sites, all within the East Gippsland Region. Typically, the Watson's tree frog is a forest-dependent species that prefers moist areas. They rely on long lasting pools that allow tadpoles to reach metamorphosis and surrounding habitat mostly of sandy soils (DAWE 2022c). Major threats to Watson's tree frog are disease, habitat fragmentation and climate change. Due to the species habitat preference, they are unlikely to be affected by offshore activities, however they are considered due to their potential presence along the eastern Victorian and southern NSW coast.

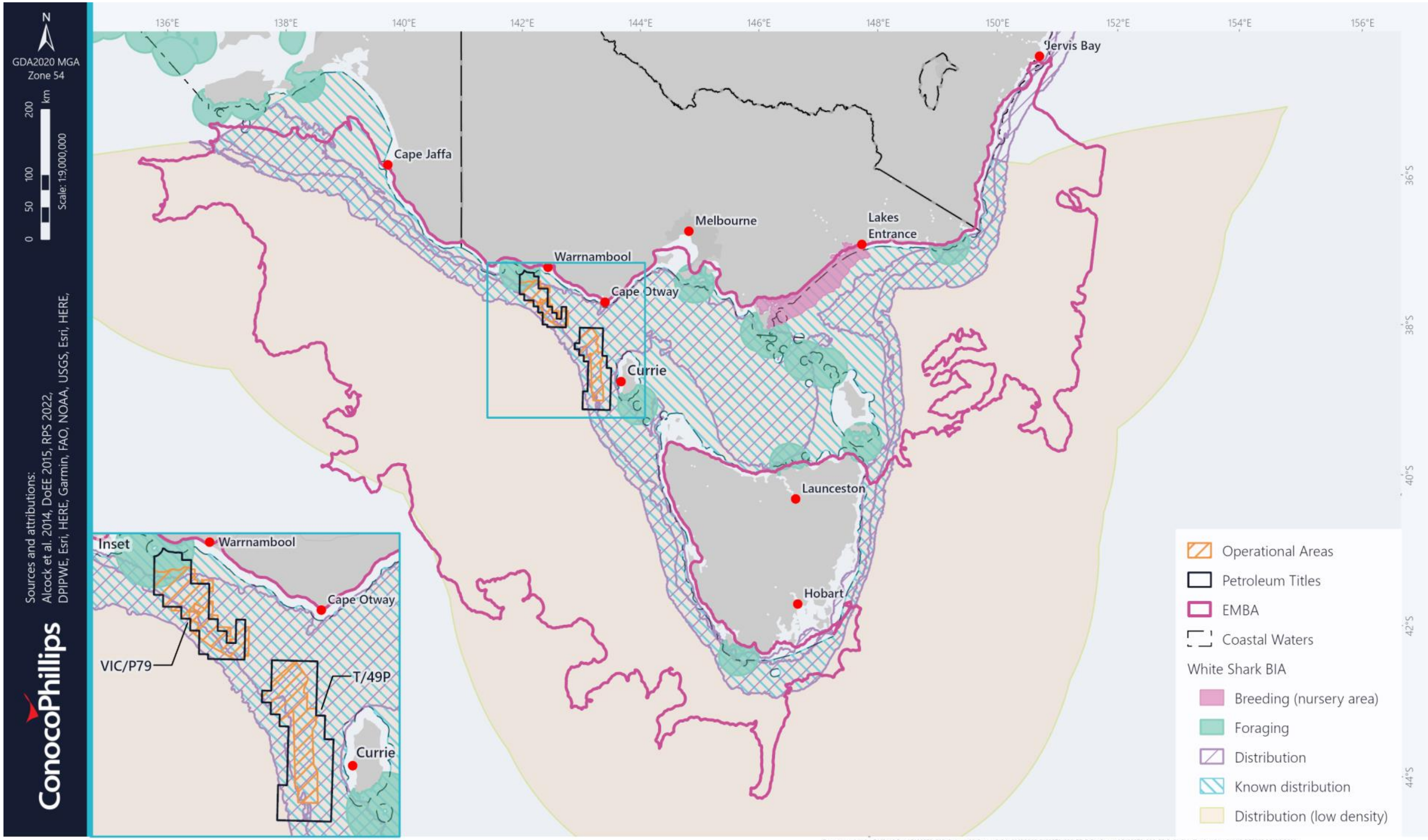


Figure 4-36: White shark Biological Important Areas within the EMBA

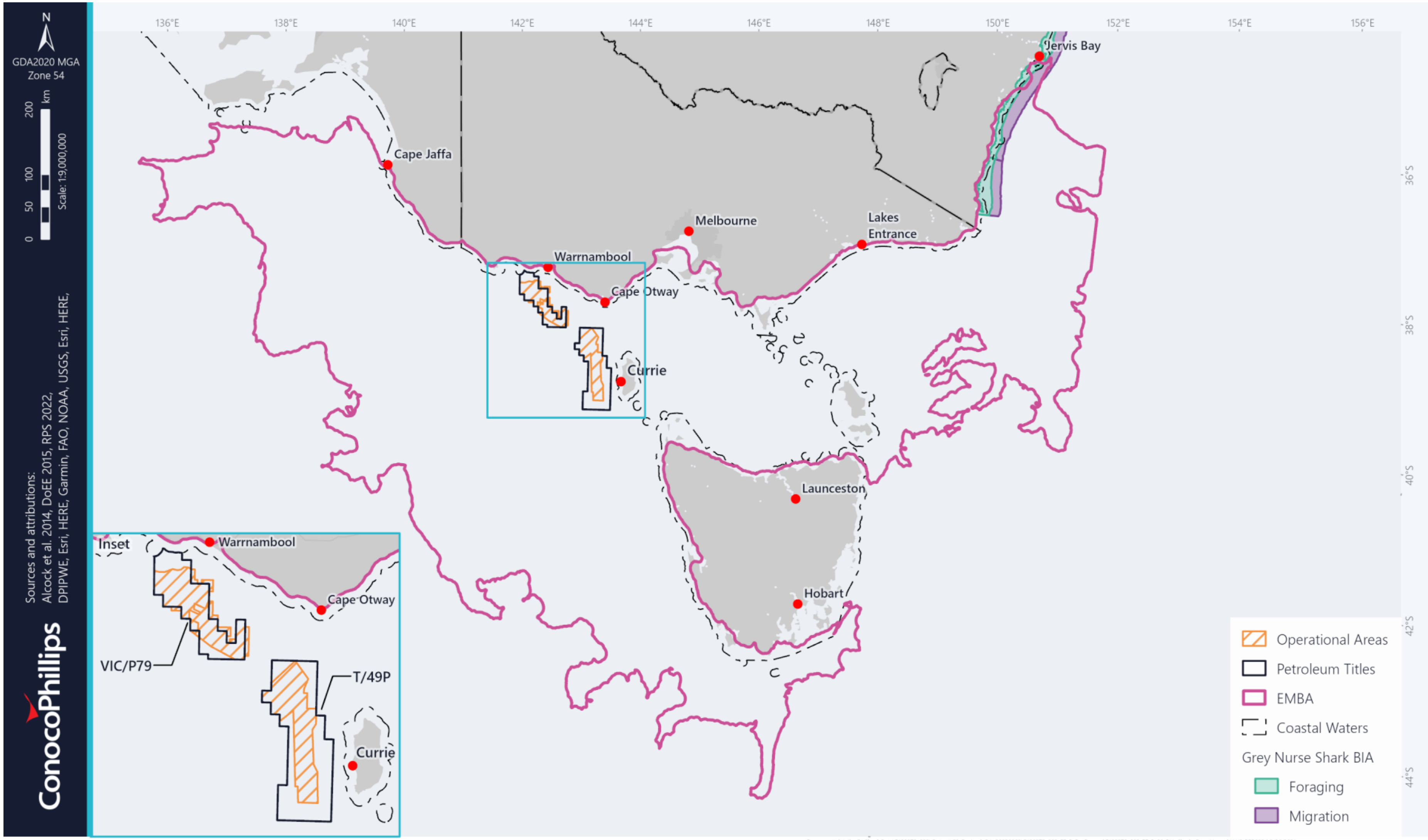


Figure 4-37: Grey nurse shark Biological Important Area within the EMBA

Table 4-9: Amphibian species that may occur within relevant EMBAs, and protection status

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	MDO (MOD)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Litoria raniformis	Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog	V	-	-	-	LO^{T} KO^{VS} KO^{VN}	KO	KO	KO	National Recovery Plan for the Southern Bell Frog Litoria raniformis
Litoria watsoni	Watson's Tree Frog	E	-	-	-	-	MO^{T} MO^{VS}	KO^{T} MO^{VS}	KO	Conservation Advice for Litoria watsoni
Litoria aurea	Green and Golden Bell Frog	V	-	-	-	-	LO^{T} LO^{VS}	KO^{T} KO^{VS} MO^{VN}	KO	Conservation Advice for Litoria aurea
Heleioporus australiacus	Giant Burrowing Frog	V	-	-	-	-	MO^{T} LO^{VS}	KO^{T} LO^{VS}	KO	Approved Conservation Advice for Heleioporus australiacus
Mixophyes balbus	Stuttering Frog, Southern Barred Frog (in Victoria)	V	-	-	-	-	-	MO^{T}	KO	Conservation Advice for Mixophyes balbus

Threatened Species: V – Vulnerable E –Endangered	Type of presence: MO–- Species or species habitat that may occur within the area LO–- Species or species habitat likely to occur within area KO–- Species or species habitat known to occur within area	Operational Area: T – T/49P VS – VIC/P79 Southern extent VN – VIC/P79 Northern extent [Table reviewed in response to Matter: I06].

4.6.7. Seabirds and Shorebirds

Birds in the marine environment can include seabirds, aquatic birds such as penguins, migratory shorebirds and other migratory species that may overfly operational areas and EMBAs. Seabirds are birds that are adapted to life in the marine environment; they can be highly pelagic, coastal, or in some cases spend a part of the year away from the sea entirely (CoA 2023) and include species such albatrosses, petrels and shearwaters. Shorebirds (or waders) inhabit the shorelines of coasts and inland water bodies for most of their lives (CoA 2023) and includes species such as sandpipers and plovers. Some bird species are listed as threatened and/or migratory under the EPBC Act 1999, and these are considered a matter of national environmental significance. Species may also be protected under state and territory environmental legislation.

The EPBC Act PMST report lists 137 species of bird with the potential to occur within the operational areas, light EMBAs and LOWC EMBAs for T/49P and VIC/P79 in the northern and southern extents (Table 4-10; Appendix B. Of the 137 bird species, 69 have an EPBC threatened status, including 7 Critically Endangered (curlew sandpiper (*Calidris ferruginea*), eastern curlew (*Numenius madagascariensis*), orange-bellied parrot (*Neophema chrysogaster*), swift parrot (*Lathamus discolor*), King Island scrubtit (*Acanthornis magna greeniana*), regent honeyeater (*Anthochaera hrygia*), plains-wanderer (*Pedionomus torquatus*)), 19 species are listed as Endangered and 35 as Vulnerable.

The EPBC Act PMST report also identified overlap between the EMBA and BIAs as detailed in Appendix B and displayed in Figure 4-38 to Figure 4-46. This includes BIAs for 8 species each of albatross and petrel, 4 species of shearwater, 4 terns, and one each of gannet, cormorant, gull, and penguin.

Figure 4-45 displays the orange-bellied parrot presence and migration routes as detailed in the Species of National Environmental Significance Distributions (public grids) (DAWE 2021) and the National Recovery Plan for the orange-bellied parrot (*Neophema chrysogaster*) (DELWP 2016).

Table 4-10: Seabird, shorebird and other marine listed bird species that may occur within the relevant EMBAs, and protection status

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Light 20 km	Flaring 50 km	MDO (Mod)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Migratory Seabirds												
Apus pacificus	Fork-tailed swift	-	✓	✓	-	LO^{VS} LO^{VN}	LO	LO	LO	LO	LO	-
Anous stolidus	Common noddy	-	✓	✓	-	-	-	-	LO	LO	LO	-
Hydroprogne caspia	Caspian tern	-	✓	✓	-	-	-	-	BKO	BKO	BKO	-
Sternula albifrons	Little tern	-	✓	✓	-	MO^{VN}	MO^{T} MO^{VS} BKO^{VN}	MO	BKO	BKO	BKO	-
Ardenna carneipes	Flesh-footed shearwater, Fleshy-footed shearwater	-	✓	✓	FLO^{T} FLO^{VS} LO^{VN}	FLO^{T} FLO^{VS} KO^{VN}	FLO^{T} FLO^{VS} KO^{VN}	FLO^{T} FLO^{VS} KO^{VN}	KO	KO	KO	-
Ardenna grisea	Sooty shearwater	V	✓	✓	MO	MO	MO	MO	BKO^{T} LO^{VS} MO^{VN}	BKO^{T} LO^{VS} LO^{VN}	BKO	Conservation Advice for Ardenna grisea (sooty shearwater)
Diomedea antipodensis gibsoni	Gibson's albatross	V	-	✓	-	-	-	FLO^{T}	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche eremita	Chatham albatross	E	✓	✓	-	-	-	-	FMO	FMO	FMO	National Recovery Plan for albatrosses and petrels 2022
Diomedea antipodensis	Antipodean albatross	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Diomedea epomophora	Southern royal albatross	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Diomedea exulans	Wandering albatross	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Diomedea sanfordi	Northern royal albatross	E	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Macronectes giganteus	Southern giant-petrel, Southern giant petrel	E	✓	✓	FLO^{T} MO^{VS} MO^{VN}	FLO^{T} MO^{VS} MO^{VN}	FLO^{T} LO^{VS} MO^{VN}	FLO^{T} FLO^{VS} MO^{VN}	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Macronectes halli	Northern giant petrel	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Phoebetria fusca	Sooty albatross	V	✓	✓	LO	LO	LO	LO	LO	LO	LO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche bulleri	Buller's albatross, Pacific albatross	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche cauta	Shy albatross	E	✓	✓	FLO	FLO	FLO	BKO^{T} FLO^{VS} FLO^{VN}	BKO^{T} BKO^{VS} FLO^{VN}	BKO^{T} BKO^{VS} FLO^{VN}	BKO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche chrysostoma	Grey-headed albatross	E	✓	✓	MO	MO	MO	MO	MO	MO	MO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche impavida	Campbell albatross, Campbell black-browed albatross	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche melanophris	Black-browed albatross	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche salvini	Salvin's albatross	V	✓	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	National Recovery Plan for albatrosses and petrels 2022
Thalassarche steadi	White-capped albatross	V	✓	✓	FKO	FKO	FKO	FKO	FKO	FKO	FKO	National Recovery Plan for albatrosses and petrels 2022
Fregata ariel	Lesser frigatebird, Least frigatebird	-	✓	✓	-	-	-	-	-	-	LO^{T} MO^{VN}	-
Fregata minor	Great frigatebird, Greater frigatebird	-	✓	✓	-	-	-	-	-	-	MO^{T} MO^{VN}	-
Ardenna pacifica	Wedge-tailed shearwater	-	✓	✓	-	-	-	-	-	BKO^{T}	BKO	-
Ardenna tenuirostris	Short-tailed shearwater	-	✓	✓	-	BKO^{VN}	BKO^{VS} BKO^{VN}	BKO	BKO	KO	BKO	-
Calonectris leucomelas	Streaked shearwater	-	✓	✓	-	-	-	-	-	-	LO^{T} LO^{VS}	-
Resident Seabirds												
Pachyptila turtur subantarctica	Fairy prion (southern)	V	-	-	MO	MO^{T} MO^{VS} KO^{VN}	KO	KO	KO	KO	KO	Conservation advice Pachyptila turtur subantarctica fairy prion (southern)
Pachyptila turtur	Fairy prion	-	-	✓	MO	MO^{T} MO^{VS} KO^{VN}	KO	KO	KO	KO	KO	-
Pterodroma cervicalis	White-necked petrel	-	-	✓	-	-	-	-	MO	MO	MO	-
Pterodroma leucoptera leucoptera	Gould's petrel, Australian Gould's petrel	E	-	-	MO	MO	MO	MO	MO	BKO^{T} MO^{VS} MO^{VN}	BKO	Gould's Petrel (Pterodroma leucoptera leucoptera) Recovery Plan
Pterodroma mollis	Soft-plumaged petrel	V	-	✓	MO	MO	MO	MO	MO^{T} MO^{VS} FLO^{VN}	MO^{T} FLO^{VS} FLO^{VN}	BKO^{T} FLO^{VS} FLO^{VN}	Conservation Advice Pterodroma Mollis soft-plumaged petrel

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Light 20 km	Flaring 50 km	MDO (Mod)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Sternula nereis nereis	Australian fairy tern	V	-	-	FLO	FLO^{T} FLO^{VS} KO^{VN}	KO	KO	KO	KO	KO	Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern)
Sternula nereis	Fairy tern	-	-	✓	-	-	-	-	BKO	BKO	BKO	-
Fregetta grallaria grallaria	White-bellied storm-petrel (Tasman Sea), White-bellied storm-petrel (Australasian)	V	-	-	LO^{T}	LO^{T}	LO^{T}	LO	LO	LO	LO	-
Halobaena caerulea	Blue petrel	V	-	✓	MO	MO	MO	MO	MO	MO	MO	Conservation Advice *Halobaena caerulea* blue petrel
Pelagodroma marina	White-faced storm-petrel	-	-	✓	-	-	-	BKO^{T}	BKO	BKO	BKO	-
Pelecanoides urinatrix	Common diving-petrel	-	-	✓	-	BKO^{VN}	BKO^{VN}	BKO^{VN}	BKO	BKO	BKO	-
Pterodroma macroptera	Great-winged petrel	-	-	✓	-	-	-	-	FKO^{VN}	FKO^{VS} FKO^{VN}	FKO	-
Stercorarius antarcticus	Brown skua	-	-	✓	MO	MO	MO	MO	MO	MO	MO	-
Thalassarche bulleri platei	Northern buller's albatross, Pacific albatross	V	-	✓	FLO	FLO	FLO	FLO	FLO	FLO	FLO	-
Acanthiza pusilla magnirostris	King Island brown thornbill, brown thornbill (King Island)	E	-	-	-	-	KO^{T}	KO^{T}	KO	KO	KO	Conservation Advice for *Acanthiza pusilla magnirostris* (King Island brown thornbill)
Migratory shorebirds												
Calidris canutus	Red knot	V	✓	✓	MO	MO^{T} MO^{VS} KO^{VN}	MO^{T} KO^{VS} KO^{VN}	MO^{T} MO^{VS} KO^{VN}	KO	KO	KO	Conservation Advice *Calidris canutus* Red Knot
Calidris tenuirostris	Great knot	V	✓	✓	-	-	-	-	RKO	RKO	RKO	Conservation advice *Calidris tenuirostriss* Great knot
Calidris ferruginea	Curlew sandpiper	CE	✓	✓	MO	MO^{T} MO^{VS} KO^{VN}	KO	KO	KO	KO	KO	Conservation Advice *Calidris ferruginea* Curlew Sandpiper
Numenius madagascariensis	Eastern curlew, far eastern curlew	CE	✓	✓	MO	MO^{T} MO^{VS} KO^{VN}	LO^{T} KO^{VS} KO^{VN}	LO^{T} KO^{VS} KO^{VN}	KO	KO	KO	Conservation Advice *Numenius madagascariensis* Eastern Curlew
Thinornis cucullatus cucullatus	Hooded plover (eastern), Eastern hooded plover	V	-	✓	-	KO^{VN}	KO	KO	KO	KO	KO	Conservation Advice *Thinornis rubricollis rubricollis* Hooded Plover (Eastern)
Thinornis cucullatus	Hooded dotterel, Hooded plover	-	-	✓	-	KO^{VN}	KO	KO	KO	KO	KO	-
Actitis hypoleucos	Common sandpiper	-	✓	✓	MO	MO^{T} MO^{VS} KO^{VN}	KO	KO	KO	KO	KO	-
Calidris acuminata	Sharp-tailed sandpiper	V	✓	✓	MO	MO^{T} MO^{VS} RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} KO^{VS} RKO^{VN}	RKO	RKO	RKO	Conservation Advice for *Calidris acuminata* (sharp-tailed sandpiper)
Calidris melanotos	Pectoral sandpiper	-	✓	✓	MO	MO^{T} MO^{VS} KO^{VN}	KO	MO^{T} MO^{VS} KO^{VN}	KO	KO	KO	-
Charadrius veredus	Oriental plover, Oriental dotterel	-	✓	✓	-	-	-	-	-	KO^{T} KO^{VS}	KO	-
Cuculus optatus	Oriental cuckoo, Horsfield's cuckoo	-	✓	-	-	-	-	-	-	MO^{T} MO^{VS}	KO	-
Hirundapus caudacutus	White-throated needletail	V	✓	✓	-	KO^{VN}	KO	KO	KO^{T} KO^{VS} RKO^{VN}	KO^{T} KO^{VS} RKO^{VN}	RKO	Conservation Advice Hirundapus caudacutus White-throated Needletail
Monarcha melanopsis	Black-faced monarch	-	✓	✓	-	MO^{VN}	MO	MO	KO	KO	KO	-
Motacilla flava	Yellow wagtail	-	✓	✓	-	MO^{VN}	MO	MO	KO^{T} MO^{VS} KO^{VN}	KO	KO	-
Myiagra cyanoleuca	Satin flycatcher	-	✓	✓	-	KO^{VN}	BKO	KO	BKO	BKO	BKO	-
Phaethon lepturus	White-tailed tropicbird	-	✓	✓	-	-	-	-	-	MO^{T}	MO	-
Rhipidura rufifrons	Rufous fantail	-	✓	✓	-	LO^{VN}	KO	KO	KO	KO	KO	-
Symposiachrus trivirgatus	Spectacled monarch	-	✓	✓	-	-	-	-	KO^{VS}	KO^{T} KO^{VS}	KO	-
Thalassarche carteri	Indian yellow-nosed albatross	V	✓	✓	LO	LO	LO	LO	LO	LO	LO	National Recovery Plan for albatrosses and petrels 2022
Thalasseus bergii	Greater crested tern	-	✓	✓	-	BKO^{VN}	BKO^{VS} BKO^{VN}	BKO^{VN}	BKO	BKO	BKO	-
Onychoprion anaethetus	Bridled Tern	-	✓	✓	-	-	-	-	-	-	KO^{VN}	-

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Light 20 km	Flaring 50 km	MDO (Mod)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Tringa brevipes	Grey-tailed tattler	-	✓	✓	-	RKO^{VN}	RKO^{VS} RKO^{VN}	RKO^{VN}	RKO	RKO	RKO	-
Tringa incana	Wandering tattler	-	✓	✓	-	-	-	-	RKO^{T} RKO^{VS} FKO^{VN}	RKO	RKO	-
Other marine listed birds												
Acanthornis magna greeniana	King Island scrubtit, Scrubtit (King Island)	CE	-	-	-	-	KO^{T}	KO^{T}	KO	KO	KO	Commonwealth Listing Advice on *Acanthornis magnus greenianus* (Scrubtit (King Island))
Anthochaera phrygia	Regent honeyeater	CE	-	-	-	-	MO	MO	KO^{T} KO^{VS} FLO^{VN}	KO	KO	Conservation Advice *Anthochaera phrygia* regent honeyeater
Anseranas semipalmata	Magpie goose	-	-	✓	-	MO^{VN}	MO^{VS} MO^{VN}	MO^{VN}	MO	MO	MO	-
Aquila audax fleayi	Tasmanian wedge-tailed eagle, Wedge-tailed eagle	E	-	-	-	-	MO^{T}	LO^{T} MO^{VS}	BLO^{T} LO^{VS} MO^{VN}	BLO	BLO	Threatened Tasmanian Eagles Recovery Plan 2006-2010
Arenaria interpres	Ruddy turnstone	V	✓	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	Conservation Advice for *Arenaria interpres* (ruddy turnstone)
Botaurus poiciloptilus	Australasian bittern	E	-	-	-	KO^{VN}	KO	KO	KO	KO	KO	Conservation Advice *Botaurus poiciloptilus* Australasian Bittern
Bubulcus ibis	Cattle egret	-	-	✓	-	MO^{VN}	MO^{T} BLO^{VS} BLO^{VN}	MO	MO	MO	BLO	-
Calidris alba	Sanderling	-	✓	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	-
Calidris subminuta	Long-toed stint	-	✓	✓	-	-	-	-	-	-	RKO	-
Calidris ruficollis	Red-necked stint	-	✓	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	-
Callocephalon fimbriatum	Gang-gang cockatoo	E	-	-	-	LO^{VN}	KO	KO	KO	KO	KO	Conservation Advice for *Callocephalon fimbriatum* (Gang-gang Cockatoo)
Calyptorhynchus lathami lathami	South-eastern glossy black-cockatoo	V	-	-	-	-	-	-	LO^{T} KO^{VS}	KO^{T} KO^{VS}	KO	Conservation Advice for *Calyptorhynchus lathami lathami* (South-eastern Glossy Black Cockatoo)
Calyptorhynchus 179anksia graptogyne	South-eastern red-tailed black-cockatoo	E	-	-	-	-	KO^{VN}	MO^{VN}	KO^{T} FKO^{VS} FKO^{VN}	KO^{T} FKO^{VS} FKO^{VN}	KO^{T} FKO^{VS} FKO^{VN}	National Recovery Plan for the South-Eastern Red-tailed Black-Cockatoo *Calyptorhynchus banksii graptogyne*
Ceyx azureus diemenensis	Tasmanian azure kingfisher	E	-	-	-	-	KO^{T}	KO^{T} MO^{VS}	BKO	BKO^{T} BKO^{VS} KO^{VN}	BKO	Commonwealth Listing Advice on *Ceyx azureus diemenensis* (Tasmanian Azure Kingfisher)
Chalcites osculans	Black-eared cuckoo	-	-	✓	-	KO^{VN}	KO^{VS} KO^{VN}	KO^{VS} KO^{VN}	KO	KO	KO	-
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	-	-	-	MO^{VN}	MO^{VS} MO^{VN}	MO^{VS} MO^{VN}	MO	MO	KO	Conservation Advice for *Climacteris picumnus victoriae* (brown treecreeper (south-eastern))
Chroicocephalus novaehollandiae	Silver gull	-	-	✓	-	BKO^{VN}	BKO^{VS} BKO^{VN}	BKO^{T} BKO^{VN}	BKO	BKO	BKO	-
Charadrius bicinctus	Double-banded plover	-	✓	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	-
Charadrius mongolus	Lesser sand plover, Mongolian plover	E	✓	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	Conservation Advice *Charadrius mongolus* Lesser sand plover
Charadrius leschenaultii	Greater sand plover, Large sand plover	V	✓	✓	-	MO^{VN}	LO	LO	KO	KO	KO	Conservation Advice *Charadrius leschenaultii* Greater sand plover
Charadrius ruficapillus	Red-capped plover	-	-	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	-
Dasyornis brachypterus	Eastern bristlebird	E	-	-	-	-	-	-	KO^{T} KO^{VS}	KO^{T} KO^{VS}	KO	National Recovery Plan for Eastern Bristlebird *Dasyornis brachypterus*

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Light 20 km	Flaring 50 km	MDO (Mod)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Eudyptula minor	Little penguin	-	-	✓	-	BKO^{VN}	BKO	BKO	BKO	BKO	BKO	-
Falco hypoleucos	Grey falcon	V	-	-	-	LO^{VN}	MO^{T} LO^{VS} LO^{VN}	MO^{VS} LO^{VN}	LO	LO	LO	Conservation Advice *Falco hypoleucos* Grey Falcon
Gallinago megala	Swinhoe's snipe	-	✓	✓	-	RLO^{VN}	RLO^{VS} RLO^{VN}	RLO^{VS} RLO^{VN}	RLO	RLO	RLO	-
Gallinago hardwickii	Latham's snipe, Japanese snipe	V	✓	✓	-	KO^{VN}	KO	KO	KO	KO	KO	Conservation Advice for *Gallinago hardwickii* (Latham's snipe)
Gallinago stenura	Pin-tailed snipe	-	✓	✓	-	RLO^{VN}	RLO^{VS} RLO^{VN}	RLO^{VS} RLO^{VN}	RKO	RKO	RKO	-
Grantiella picta	Painted honeyeater	V	-	-	-	MO^{VN}	MO^{VS} KO^{VN}	MO	KO	KO	KO	Conservation Advice *Grantiella picta* painted honeyeater
Haliaeetus leucogaster	White-bellied sea-eagle	-	-	✓	-	KO^{VN}	BKO	BKO	BKO	BKO	BKO	-
Himantopus himantopus	Pied stilt, Black-winged stilt	-	-	✓	-	RKO^{VN}	RKO^{VS} RKO^{VN}	RKO^{VN}	RKO	RKO	RKO	-
Larus pacificus	Pacific gull	-	-	✓	-	-	-	BKO^{T}	BKO	BKO	BKO	-
Larus dominicanus	Kelp gull	-	-	✓	-	-	-	-	BKO	BKO	BKO	-
Lathamus discolor	Swift parrot	CE	-	✓	-	MO^{VN}	LO	LO^{T} MO^{VS} MO^{VN}	KO	BKO^{T} KO^{VS} KO^{VN}	BKO	Conservation Advice *Lathamus discolor* swift parrot
Limicola falcinellus	Broad-billed sandpiper	-	✓	✓	-	-	-	-	RKO	RKO	RKO	-
Limosa lapponica	Bar-tailed godwit	-	✓	✓	-	KO^{VN}	KO	KO	KO	KO	KO	-
Limosa limosa	Black-tailed godwit	E	✓	✓	-	-	-	-	RKO	RKO	RKO	Conservation Advice for *Limosa limosa* (black-tailed godwit)
Limosa lapponica baueri	Nunivak bar-tailed godwit, Western Alaskan bar-tailed	E	-	-	-	KO^{VN}	KO	KO	KO	KO	KO	Conservation Advice *Limosa lapponica baueri* (Alaskan bar-tailed godwit)
Leipoa ocellata	Malleefowl	V	-	-	-	-	-	-	-	-	LO^{VS} LO^{VN}	National Recovery Plan for Malleefowl *Leipoa ocellata*
Merops ornatus	Rainbow bee-eater	-	-	✓	-	MO^{VN}	MO	MO	MO	MO	MO	-
Motacilla cinerea	Grey Wagtail	-	✓	✓	-	-	-	-	-	-	KO^{VS} KO^{VN}	-
Morus capensis	Cape gannet	-	-	✓	-	-	BKO^{VN}	BKO^{VN}	BKO	BKO	BKO	-
Morus serrator	Australasian gannet	-	-	✓	-	-	BKO^{VN}	BKO^{VN}	BKO	BKO	BKO	-
Neophema chrysogaster	Orange-bellied parrot	CE	-	✓	MLO^{T}	MLO^{T} MLO^{VS} KO^{VN}	MKO^{T} KO^{VS} KO^{VN}	MKO^{T} MLO^{VS} KO^{VN}	MKO	BKO^{T} MKO^{VS} MKO^{VN}	BKO	National Recovery Plan for the Orange-bellied Parrot, *Neophema chrysogaster*
Neophema chrysostoma	Blue-winged parrot	V	-	✓	-	KO^{VN}	KO	KO	KO	KO	KO	Conservation Advice for *Neophema chrysostoma* (blue-winged parrot)
Numenius phaeopus	Whimbrel	-	✓	✓	-	RKO^{VN}	RKO^{VS} RKO^{VN}	RKO^{VN}	RKO	RKO	RKO	-
Numenius minutus	Little curlew, Little whimbrel	-	✓	✓	-	RLO^{VN}	RLO^{VS} RLO^{VN}	RLO^{VS} RLO^{VN}	RLO	RLO	RKO^{T} RLO^{VS} RLO^{VN}	-
Onychoprion fuscatus	Sooty tern	-	-	✓	-	-	-	-	BKO	BKO	BKO	-
Pandion haliaetus	Osprey	-	✓	✓	-	KO^{VN}	KO	KO	KO	KO	KO	-
Pedionomus torquatus	Plains-wanderer	CE	-	-	-	LO^{VN}	LO^{VS} LO^{VN}	LO^{VN}	LO	LO	LO	Conservation Advice *Pedionomus torquatus* plains-wanderer
Pezoporus occidentalis	Night Parrot	E	-	-	-	-	-	-	MO^{VN}	MO^{VN}	MO^{VS} MO^{VN}	Conservation Advice *Pezoporus occidentalis* night parrot
Phalacrocorax fuscescens	Black-faced cormorant	-	-	✓	-	KO^{VN}	BKO	BKO^{VS} BKO^{VN}	BKO	BKO	BKO	-
Phalaropus lobatus	Red-necked phalarope	-	✓	✓	-	-	-	-	RKO	RKO	RKO	-
Philomachus pugnax	Ruff (Reeve)	-	✓	✓	-	-	-	-	RKO	RKO	RKO	-
Platycercus caledonicus brownii	Green rosella (King Island)	V	-	-	-	-	KO^{T}	KO^{T}	KO	KO	KO	Conservation Advice *Platycercus caledonicus brownii* green rosella (King Island)
Pluvialis fulva	Pacific golden plover	-	✓	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	-

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Light 20 km	Flaring 50 km	MDO (Mod)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Pluvialis squatarola	Grey plover	V	✓	✓	-	-	-	-	RKO	RKO	RKO	Conservation Advice for *Pluvialis squatarola* (grey plover)
Stiltia isabella	Australian pratincole	-	-	✓	-	-	-	-	RKO^{T} RKO^{VS}	RKO^{VN}	RKO	-
Sterna striata	White-fronted tern	-	-	✓	FLO^{T} MMO^{VS} MMO^{VN}	FLO	FLO	FLO	FLO	FLO	BKO^{T} BLO^{VS} BLO^{VN}	-
Tringa nebularia	Common greenshank, Greenshank	E	✓	✓	-	KO^{VN}	LO^{T} KO^{VS} KO^{VN}	KO^{T} LO^{VS} KO^{VN}	KO	KO	KO	Conservation Advice for *Tringa nebularia* (common greenshank)
Recurvirostra novaehollandiae	Red-necked avocet	-	-	✓	-	RKO^{VN}	RKO^{VS} RKO^{VN}	RKO^{VN}	RKO	RKO	RKO	-
Tyto novaehollandiae castanops (Tasmanian population)	Masked owl (Tasmanian)	V	-	-	-	-	-	-	BKO^{T} MO^{VS}	BKO	BKO	Approved Conservation Advice for *Tyto novaehollandiae castanops* (Tasmanian Masked Owl)
Pardalotus quadragintus	Forty-spotted pardalote	E	-	-	-	-	-	-	-	-	FKO^{T}	Conservation Advice *Pardalotus quadraginatus* forty-spotted pardalote
Pterodroma neglecta neglecta	Kermadec petrel (western)	V	-	-	-	-	-	-	-	FMO^{T}	FMO	-
Pycnoptilus floccosus	Pilotbird	V	-	-	-	-	-	-	KO	KO	KO	Conservation Advice for Pycnoptilus floccosus (Pilotbird)
Xenus cinereus	Terek sandpiper	V	✓	✓	-	-	-	-	RKO	RKO	RKO	Conservation Advice for *Xenus cinereus* (terek sandpiper)
Tringa stagnatilis	Marsh sandpiper, Little greenshank	-	✓	✓	-	RKO^{VN}	KO^{T} RKO^{VS} RKO^{VN}	KO^{T} RKO^{VN}	RKO	RKO	RKO	-
Tringa glareola	Wood sandpiper	-	✓	✓	-	RKO^{VN}	RKO^{VS} RKO^{VN}	RKO^{VN}	RKO	RKO	RKO	-
Strepera fuliginosa colei	Black currawong (King Island)	V	-	-	-	-	BLO^{T}	BLO^{T} BLO^{VS}	BLO	BLO	BLO	Conservation Advice *Strepera fuliginosa colei* black currawong (King Island)
Rostratula australis	Australian painted snipe	E	-	✓	-	KO^{VN}	LO^{T} KO^{VS} KO^{VN}	MO^{T} LO^{VS} KO^{VN}	KO	KO	KO	Approved Conservation Advice for *Rostratula australis* (Australian painted snipe)

Threatened Species:
V – Vulnerable
E – Endangered
CE – Critically Endangered

Type of presence:
MO–- Species or species habitat that may occur within the area
LO–- Species or species habitat likely to occur within the area
KO–- Species or species habitat known to occur within area
RLO – Roosting likely to occur within area
RKO – Roosting known to occur within area
BLO – Breeding likely to occur within area
BKO – Breeding known to occur within area
FMO – Foraging, feeding or related behaviour may occur within area
FLO – Foraging, feeding or related behaviour likely to occur within area
FKO – Foraging, feeding or related behaviour known to occur within area
MLO – Migration route likely to occur within area
MKO – Migration route known to occur within area

Operational Area:
T – T/49P
VS – VIC/P79 Southern extent
VN – VIC/P79 Northern extent

✓ Listed Migratory/Marine species
* Matter of National Environmental Significance

Source: PMST; Appendix B

[Table updated in response to Matter: I06].

Table 4-11: Seabird and shorebird biologically important areas (BIAs) in relation to EMBAs

Scientific Name	Common Name	Operational Area	Light 20 km	Flaring 50 km	MDO (mod)	MDO (low)	LOWC (mod)	EMBA
Diomedea antipodensis	Antipodean albatross	F	F	F	F	F	F	F
Morus serrator	Australasian gannet	-	F^{VN}	F A^{VN}	F$^{T, VN}$ A$^{T, VN}$	F A	F A	F A
Thalassarche melanophris	Black-browed albatross	F	F	F	F	F	F	F
Phalacrocorax fuscescens	Black-faced cormorant	-	F^{T}	F^{T}	F^{T}	F	F	F

Scientific Name	Common Name	Operational Area	Light 20 km	Flaring 50 km	MDO (mod)	MDO (low)	LOWC (mod)	EMBA
				B^{T}	B^{T}	B	B	B
Procellaria parkinsoni	Black petrel	-	-	-	-	-	F^{T}	F
Thalassarche bulleri	Buller's albatross, Pacific albatross	F	F	F	F	F	F	F
Thalassarche impavida	Campbell albatross, Campbell black-browed albatross	F	F	F	F	F	F	F
Hydroprogne caspia	Caspian tern	-	-	-	-	-	-	F^{VN}
Pelecanoides urinatrix	Common diving-petrel	F	F B^{VN}	F B^{VN}	F $B^{T, VN}$	F B	F B	F B
Sternula nereis	Fairy tern	-	-	-	-	-	-	F^{vn}
Ardenna carneipes	Flesh-footed shearwater, Fleshy-footed shearwater	-	-	-	-	-	$F^{T, VS}$	F
Pterodroma macroptera	Great-winged petrel	-	-	-	-	-	-	F
Thalasseus bergii	Greater crested tern	-	-	-	-	-	F^{T} B^{T}	F B
Thalassarche carteri	Indian yellow-nosed albatross	F	F	F	F	F	F	F
Eudyptula minor	Little penguin	-	-	F^{T} B^{T}	$F^{T, VS}$ B^{T}	F B	F B	F B
Macronectes halli	Northern giant petrel	-	-	-	-	-	-	F
Larus pacificus	Pacific Gull	-	-	-	-	-	-	F^{vn}
Ardenna tenuirostris	Short-tailed shearwater	$F^{T, VS}$	$F^{T, VS}$	F B^{T}	F B^{T}	F B	F B	F B
Thalassarche cauta	Shy albatross	F	F	F	F B^{T}	F B^{T}	F B^{T}	F B
Pterodroma mollis	Soft-plumaged petrel	-	-	-	-	$F^{T, VS}$	F	F $B^{T, VN}$
Ardenna grisea	Sooty shearwater	-	-	-	-	$F^{T, VS}$	$F^{T, VS}$ B^{T}	F B
Macronectes giganteus	Southern giant-petrel, Southern giant petrel	-	-	-	-	-	-	F
Diomedea exulans	Wandering albatross	F	F	F	F	F	F	F
Ardenna pacifica	Wedge-tailed shearwater	F	F	F $B^{VS, VN}$	F $B^{VS, VN}$	F B	F B	F B
Thalassarche steadi	White-capped albatross	-	-	-	-	-	-	F
Pelagodroma marina	White-faced storm-petrel	F^{T}	F^{T}	F^{T}	F	F $B^{VS, VN}$	F B	F B
Sterna striata	White-fronted tern	-	-	-	-	-	-	F^{T} B^{T}
Oceanites oceanites	Wilsons storm petrel	-	-	-	-	-	-	M
Biologically Important Area: (B) – Breeding (F) – Foraging (A) – Aggregation (M) – Migration	Operational Area: T – T/49P VS – VIC/P79 Southern extent VN – VIC/P79 Northern extent							

4.6.7.1. Albatrosses and Giant-petrels

Albatrosses and giant-petrels are among the most oceanic of all seabirds, and seldom come to land unless breeding (DSEWPaC 2011b). Many species, such as the Antipodean albatross (*Diomedea antipodensis*), are extremely dispersive, spending most of their time over the pelagic waters of the oceans, while others like adult shy albatrosses (*Thalassarche cauta*), tend to remain sedentary, regularly foraging over coastal waters throughout their adult lives (DSEWPaC 2011b). Albatross and giant petrel species exhibit a broad range of diets and foraging behaviours, and hence at-sea distributions are diverse. Combined with their ability to cover vast oceanic distances, all waters within Australian jurisdiction can be considered foraging habitat, however the most critical foraging habitat is those waters 25°S where many species spend the majority of their foraging time (DSEWPaC 2011b). Albatross and petrels are likely to overfly and forage within the operational areas and the EMBA.

Many of the albatross and giant petrel species listed are formally managed under the National Recovery Plan for Threatened Albatrosses and Petrels 2022 (DCCEEW 2022e). There are numerous threats to albatrosses both on terrestrial breeding sites and at-sea in their foraging habitat. Land based threats are specific to Australian populations whereas threats faced at sea may affect individuals from any population that spends some part of their life foraging in waters under Australian jurisdiction (DSEWPaC 2011ba). The most pervasive threat to albatross and giant petrel survival is the accidental mortality and injury arising from interactions with human fishing activities. These interactions are the focus of conservation efforts, however other threats such as climate change and marine pollution have also been recognised (DCCEEW 2022e).

Albatross species have a widespread distribution throughout the southern hemisphere. They feed mainly on cephalopods, fish and crustaceans, using surface feeding or plunge diving to seize their prey (ACAP 2023). Albatrosses are colonial, usually nesting on isolated islands and foraging across oceans in the winter months with most observations along the edge of the continental shelf (DSEWPaC 2011b). Of the species listed, the wandering albatross (*Diomedea exulans*), black-browed albatross (*Thalassarche melanophris),* grey-headed albatross (*Thalassarche chrysostoma*) and shy albatross breed in Australian jurisdictions (DCCEEW 2022). The remaining species forage in Australian waters. Albatross Island (Tas) which is a breeding colony or nesting area for the shy albatross is located within EMBA. Macquarie Island is the next closest breeding ground (black-browed albatross, grey-headed albatross and wandering albatross) is located outside the EMBA) (ACAP 2023; DCCEEW 2022e).

The **antipodean albatross** (*Diomedea antipodensis*) (EPBC Act: Vulnerable, Migratory, Marine) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). It is a sub-species of the wandering albatross. It breeds on islands in the New Zealand subantarctic with egg-laying during the austral summer and fledging from December to March (ACAP 2023). The species forages in all areas of the South-east Marine Region, excluding Bass Strait, and feeds primarily on cephalopods, fish and crustaceans (BirdLife International 2009; Gales 1998). The South-east Marine Region, excluding Bass Strait, is recognised as a foraging BIA for the species and overlaps the EMBA (Figure 4-38).

The **black-browed albatross** (*Thalassarche melanophris)* (EPBC Act: Vulnerable, Migratory, Marine) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). It has a circumpolar distribution and is found over Antarctic, subantarctic and sub-tropical waters (DoE 2015b). Breeding populations occur on Macquarie Island, adjacent Bishop and Clerk Islets, as well as locations outside the South East region occur at Heard Island and McDonald Islands (Australian external territory) (Figure 4-38). Black-browed albatross breed annually, with the breeding season beginning in September and fledging in April to May. In southern Australia, black-browed albatrosses mainly forage along the southern coasts from Perth to Sydney (Marchant and Higgins 1990; Reid et al. 2002). The majority of black-browed albatrosses seen in south-eastern Australian waters between October and January are immature birds (Reid et al. 2002), probably coming from Indian Ocean and Southern Georgian breeding colonies. Sub-adults are observed in Australian waters all year round. The entire South-east Marine Region is recognised as a foraging BIA for the species and overlaps the EMBA (Figure 4-38).

The **Buller's albatross** (*Thalassarche bulleri*) (EPBC Act: Vulnerable, Migratory, Marine) is recognised as a conservation value in the south-east (DoE 2015b). This species breeding is endemic to New Zealand but it forages across the South Pacific, in general, adults forage between 40–50°S from Tasmania eastwards to the Chatham Rise (NZ), while juveniles and non-breeding adults disperse across the South Pacific Ocean to the coast of South America (BirdLife International 2004; DSEWPaC 2011a). This species is mainly present around Tasmania from January to July (DoE 2022). Satellite tracking studies of this species from the Snares and Solander Islands (NZ) (Sagar and Weimerskirch 1996; Stahl and Sagar 2006) have shown that during much of the breeding season birds forage in New Zealand waters. However, both breeding adults and juveniles and non-breeding adults also forage around Tasmania. An important foraging area is recognised for the species in the South-east Marine Region, from south of latitude 38° S and north of latitude 45° S and bounded to the west at longitude 140° E. This area is recognised as a foraging BIA for the species and overlaps the EMBA (Figure 4-38).

The **Campbell albatross** (*Thalassarche impavida*) (EPBC Act: Vulnerable, Migratory, Marine) is a sub-species of black-browed albatross and is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). The Campbell albatross is endemic to Campbell Island (New Zealand subantarctic) and breeds annually from early August to May (ACAP 2023). Juveniles appear to migrate north and disperse through the subtropics in winter, including along the eastern coast of Australia (ACAP 2023). During winter, adults are found widely dispersed around the Tasman Sea and the south-western Pacific Ocean east of New Zealand, whereas in summer the distribution of both breeding and non-breeding birds is more restricted and southerly (32° S to 44° S) (Waugh et al. 1999). The Campbell albatross feeds on krill and fish, with some cephalopods, salps and jellyfish. The entire South-east Marine Region is recognised as a foraging BIA for the species and overlaps the EMBA (Figure 4-38).

The **Indian yellow-nosed albatross** (*Thalassarche carteri*) (EPBC Act: Vulnerable, Migratory, Marine) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). It breeds on the French subantarctic islands and on South Africa's Prince Edward Islands (ACAP 2023). A single egg is laid mid-September with fledging in March to April (DoE 2022). At-sea records indicate that, for the non-breeding range, birds disperse from their breeding islands and commonly occur off southern Africa and Australia (ACAP 2023). Recent satellite tracking data shows that, during the winter months this species occurs throughout the South-east Marine Region as far south as latitude 45º S (Delord and Weimerskirch 2011) during winter months. This is recognised as a foraging BIA for the species and overlaps the EMBA (Figure 4-39).

The **shy albatross** (*Thalassarche cauta*) (EPBC Act: Endangered (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 436), Migratory, Marine) is recognised as a conservation value in the south-east (DoE 2015b). It is the only endemic Australian albatross species, and breeds on Albatross Island, Bass Strait, and the Mewstone and Pedra Branca (Figure 4-39), off southern Tasmania in the Tasmanian Wilderness World Heritage Area (Gales 1998; Alderman et al. 2010) (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 53). The species breeds annually, laying eggs in September and fledging chicks in April (Gales 1998). The shy albatross ranges across Australian coastal waters below 25° S and is most commonly observed over the shelf waters around Tasmania and south eastern Australia (DAWE 2021). Bird band recoveries, satellite tracking and genetics show that although most frequently found around Tasmania and southern Australia, its range extends to southern Africa (Brothers et al. 1998; Abbott et al. 2006; Alderman et al. 2010). Habitats critical for the shy albatross include breeding grounds (Albatross Island, Bass Strait, Mewstone and Pedra Branca) and a substantial foraging area around Albatross Island within the EMBA (Figure 4-39).

The **wandering albatross** (*Diomedea exulans*) (EPBC Act: Vulnerable, Migratory, Marine) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). It breeds on six sub-Antarctic island groups (Marchant and Higgins 1990; ACAP 2023). The wandering albatross breeds biennially, laying eggs in December and fledging chicks between mid-November and late February. In Australian waters, a very small population breeds on Macquarie Island, outside the EMBA (Terauds et al. 2006; DAWE 2021; ACAP 2023). Limited satellite tracking of wandering albatross from Macquarie Island shows that breeding females forage north of the Island in waters off southern Tasmania, while males forage in open waters of the Southern

Ocean, south of 50° S, reflecting a spatial segregation seen in other populations of this species. Juveniles are concentrated in lower latitudes north and east of Macquarie Island in Pacific waters, off the south east coast of Australia and in New Zealand waters. Wandering albatross feed in the Southern Ocean (Nicholls et al. 1997) mainly on squid and fish but also crustaceans and carrion (Marchant and Higgins 1990). Foraging trips by breeding wandering albatross have exceeded 15,200 km between incubation bouts (Jouventin and Weimerskirch 1990). Southern Australia is an important wintering ground for non-breeding and juvenile birds from the Atlantic and Indian Ocean breeding colonies. Non-breeding and juvenile birds remain north of 50° S. During the non-breeding season, birds disperse more widely with females generally foraging in more northerly latitudes of the southern hemisphere and males generally foraging further south (Baker and Hamilton 2013). The entire South-east Marine Region north of 50° S is recognised as a foraging BIA for the species and overlaps the EMBA (Figure 4-39). It should be noted that Macquarie Island is listed as Habitat Critical for wandering albatross.

The petrel species listed in Table 4-10 are oceanic and have a widespread distribution throughout the southern hemisphere. They are colonial and breed on sub-Antarctic and Antarctic islands in a circumpolar band generally between 40°S and 60°S. Petrel species feed on small fish, cephalopods (octopus, squid and cuttlefish) and crustaceans along the edge of the continental shelf and open waters (DSEWPaC 2011b). One breeding colony for petrel species is located within the EMBA, on Maatsuyker Island (Tas) (soft plumaged petrel (*Pterodroma mollis*)). Macquarie Island is the next closest breeding colony (blue petrel (*Halobaena caerulea*), northern and southern giant petrels (*Macronectes halli, Macronectes giganteus*)) (outside the EMBA) (DSEWPaC 2011b).

The **common diving petrel** (*Pelecanoides urinatrix*) (EPBC Act: Marine) is recognised as a conservation value in the south-east (DoE 2015b). They have been recorded in waters ranging from the subtropics to the subantarctic, usually between 35 to 55° S (DoE 2015b). They are widely distributed over southern Australian and New Zealand waters. The estimated size of the Australian population is thought to exist mainly located in Victoria and Tasmania and make up approximately 5% of the global population (Baker et al. 2002). The species breeds only on islands of south-east Australia, Tasmania, New Zealand and Cook Strait. The subspecies *P. u. exsul* breeds on Macquarie Island and Heard Island (Garnett et al. 2011) which are outside the EMBA. There are 30 sites with significant breeding colonies (more than 1,000 breeding pairs) known from Tasmania (DoE 2015b). There are 12 known breeding sites in Victoria, including Seal Island, Notch Island, Cliffy Island, Rag Island, Citadel Island, Dannevig Island, McHugh Island, Wilson's Promontory, Wattle Island, Kanowna Island, Lady Julia Percy Island and Lawrence Rocks (Marchant and Higgins 1990), though the current status of some of these colonies is uncertain (DoE 2015b). These breeding sites are recognised as BIA for the species. In addition, a foraging BIA overlaps the EMBA including the operational areas (Figure 4-40).

The **black petrel** (*Procellaria parkinsoni*) (EPBC Act: Marine, Migratory) is recognised as a conservation value in the temperate east (DSEWPaC 2012a). This species is endemic to New Zealand and breeds annually and exclusively on Little Barrier Island and Great Barrier Island where eggs are laid in December and chicks fledge in May (ACAP 2023). They are typically surface feeders and shallow divers foraging in groups of up to 300 and preying mainly on squid with the occasional fish, tunicates, crustaceans and cyclostomes (ACAP 2023). Little is known about the foraging range and at-sea distribution of the black petrel; however banding data suggests that this species does forage as far as eastern Australia (ACAP 2023; Bell et al. 2009). Eastern Australia is recognised as a foraging BIA for this species and overlaps the EMBA (Figure 4-40).

The **great-winged petrel** (*Pterodroma macroptera*) (EPBC Act: Marine) is recognised as a conservation value in the temperate east and has a widespread and sparse distribution (DSEWPaC 2012a). Breeding occurs between June to January in the southern hemisphere. It nests in burrows or above ground in rock crevices, among tree roots or under scrub usually below 400 m Above Sea Level and lays a single egg (DCCEEW 2020). Outside the breeding season it disperses widely feeding mainly at night on squid, with some fish and crustaceans most of which is obtained by dipping and surface-seizing (DCCEEW 2022). A foraging BIA for the great-winged petrel overlaps the EMBA (Figure 4-40).

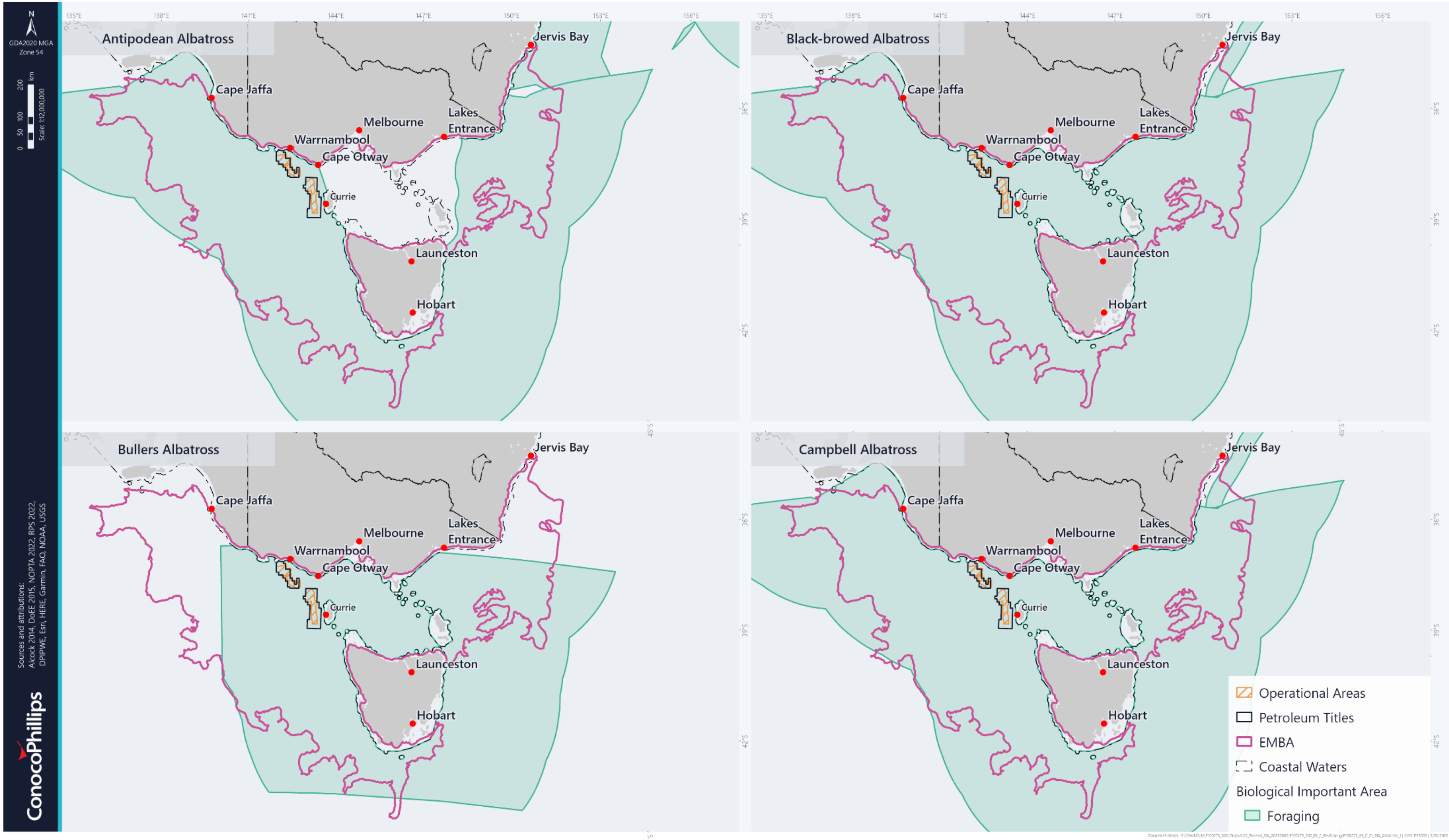


Figure 4-38: Albatross Biologically Important Areas within the EMBA

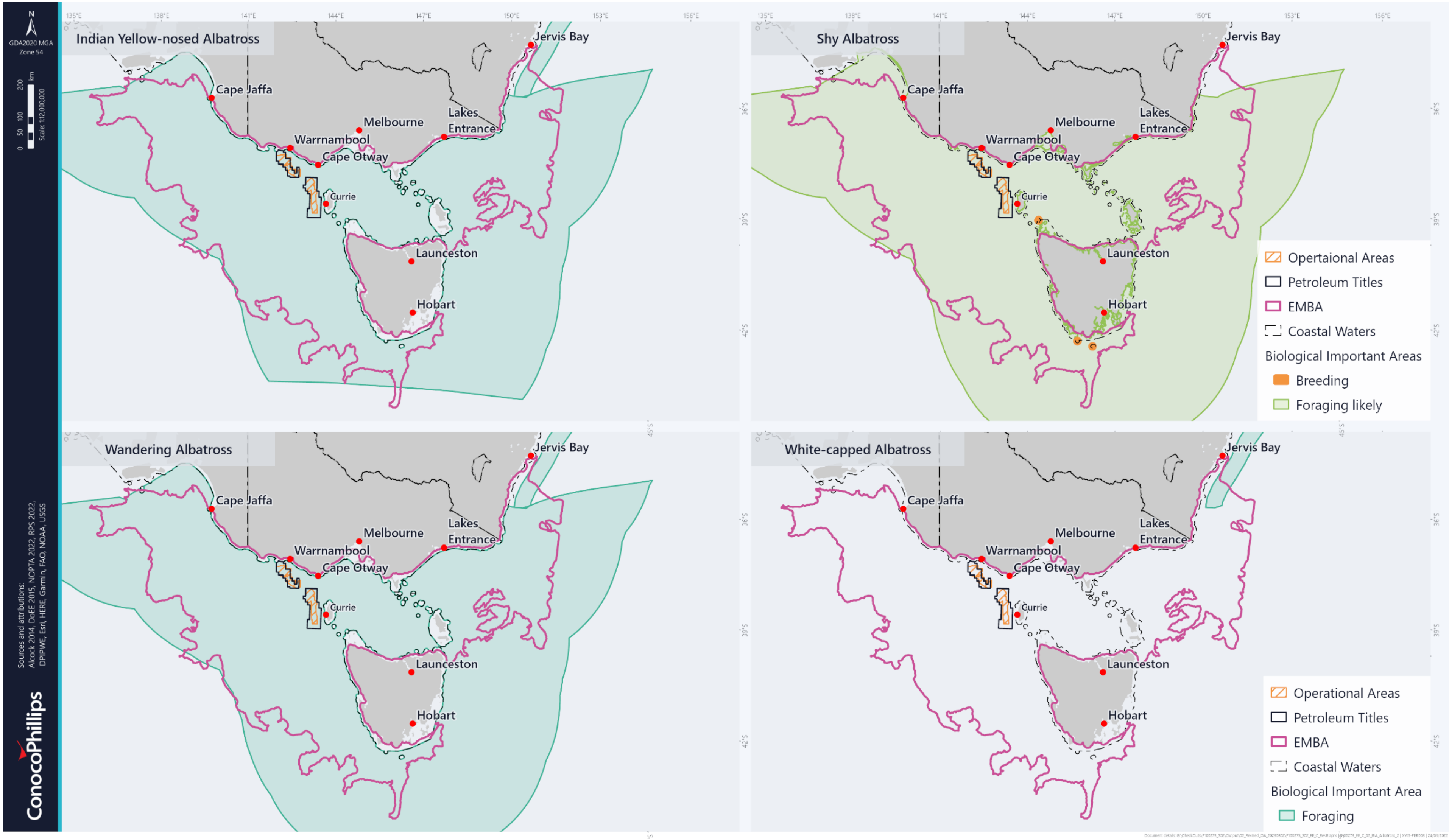


Figure 4-39: Albatross Biologically Important Areas within the EMBA

The **northern giant petrel** (*Macronectes halli*) (EPBC Act: Vulnerable, Marine, Migratory) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). This species is widely dispersed throughout the southern oceans and the breeding range encompasses the subantarctic zone (APAC 2012c). There is only one breeding site in Australia, Macquarie Island which is located outside the EMBA. Northern giant petrels breed between August and October and are surface-nesting annual breeders that exhibit strong fidelity to their breeding islands (ACAP 2023). Banded northern giant petrels from Macquarie Island are frequently observed in Australian waters (particularly along the southern coast) throughout the colder months, the majority of which (94%) are pre-breeding birds (DoE 2022). A foraging BIA for the northern giant petrel intercepts with the EMBA (Figure 4-40).

The **white-faced storm petrel** (*Pelagodroma marina*) (EPBC Act: Marine) is recognised as a conservation value in the south-east and temperate east (DoE, 2015b; DSEWPaC 2012a). The Australian population estimate for this species is estimated to be about 25% of the global population (DSEWPaC, 2011b). This species is migratory, moving from temperate breeding sites to tropical and subtropical waters in the non-breeding season. In Australia, the species returns to colonies in late September to early October, with egg laying beginning in early summer and fledging occurring mid-February to mid-March. This species is known to feed on pelagic crustaceans, small fish and other surface plankton (Marchant and Higgins, 1990). There are 15 sites with significant breeding colonies (more than 1,000 breeding pairs) in Tasmania and three sites with significant breeding colonies in Port Phillip Bay in Victoria: Tullaberga Island, Mud Island and South Channel Island (Marchant and Higgins 1990; Menkhorst et al. 1984; Menkhorst 2010). These breeding and foraging areas are recognised as BIA and both overlap with the EMBA. Additionally, the foraging BIA overlaps with the operational area of T/49P (Figure 4-40).

The **soft-plumage petrel** (*Pterodroma mollis*) (EPBC Act: Vulnerable, Marine) is recognised as a conservation value in the south-east (DoE 2015b). This is a coastal species that is generally found over temperate and subantarctic waters in the South Atlantic, southern Indian and western South Pacific Oceans (DoE 2022). Sightings of this species off the south-east coast Australia are mostly south of Tasmania, between September-April, however it is more common in the west than in the south and south-east (Marchant & Higgins 1990). It can often be seen in small groups flying fast near the surface of the waters and feeding mostly on cephalopods, some fish and crustaceans. The soft-plumage petrel breeds in burrows among rocks and tussocks and in Australian waters it breeds at two sites: on Maatsuyker Island off Tasmania (within the EMBA) and on Macquarie Island (outside the EMBA) (DoE 2015c). A foraging BIA for the soft-plumage petrel also intercepts with the EMBA (Figure 4-40).

The **southern giant petrel** (*Macronectes giganteus*) (EPBC Act: Endangered, Marine, Migratory) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). This species is the largest petrel and breeds on six subantarctic and Antarctic islands in Australian territory; Heard Island, McDonald Islands and Macquarie Island in the Southern Ocean and Giganteus Island, Hawker Island, and Frazier Island in the Australian Antarctic Territories (ACAP 2023). The southern giant petrel forages at sea and scavenges on land. The species take prey at sea by surface seizing, surface filtering, surface diving and surface plunging. The waters off south-east Australia may be particularly important wintering grounds with most southern giant petrels sighted off south-east Australia being immature birds (DoE 2022). A foraging BIA for the southern giant petrel intercepts the EMBA (Figure 4-40).

The **Wilson's storm-petrel** (*Oceanites oceanicus*) (EPBC Act: Marine, Migratory) is recognised as a conservation value in the temperate east (DSEWPaC 2012a). This species is one of the world's most abundant seabirds and the smallest endotherm that breeds in Antarctic waters (DoE 2022). They are a gregarious species congregating when feeding and migrating and breeding colonially, however at sea they are found singularly or in a small flock. Wilson's storm-petrels undertake a trans-equatorial migration in autumn spending the non-breeding season in the northern hemisphere (DoE 2022). The autumn months are when most species observations occur in Australia along the coast of NSW, Victoria, Tasmania and South Australia. These migration routes are recognised as a BIA and intercept the EMBA (Figure 4-40).

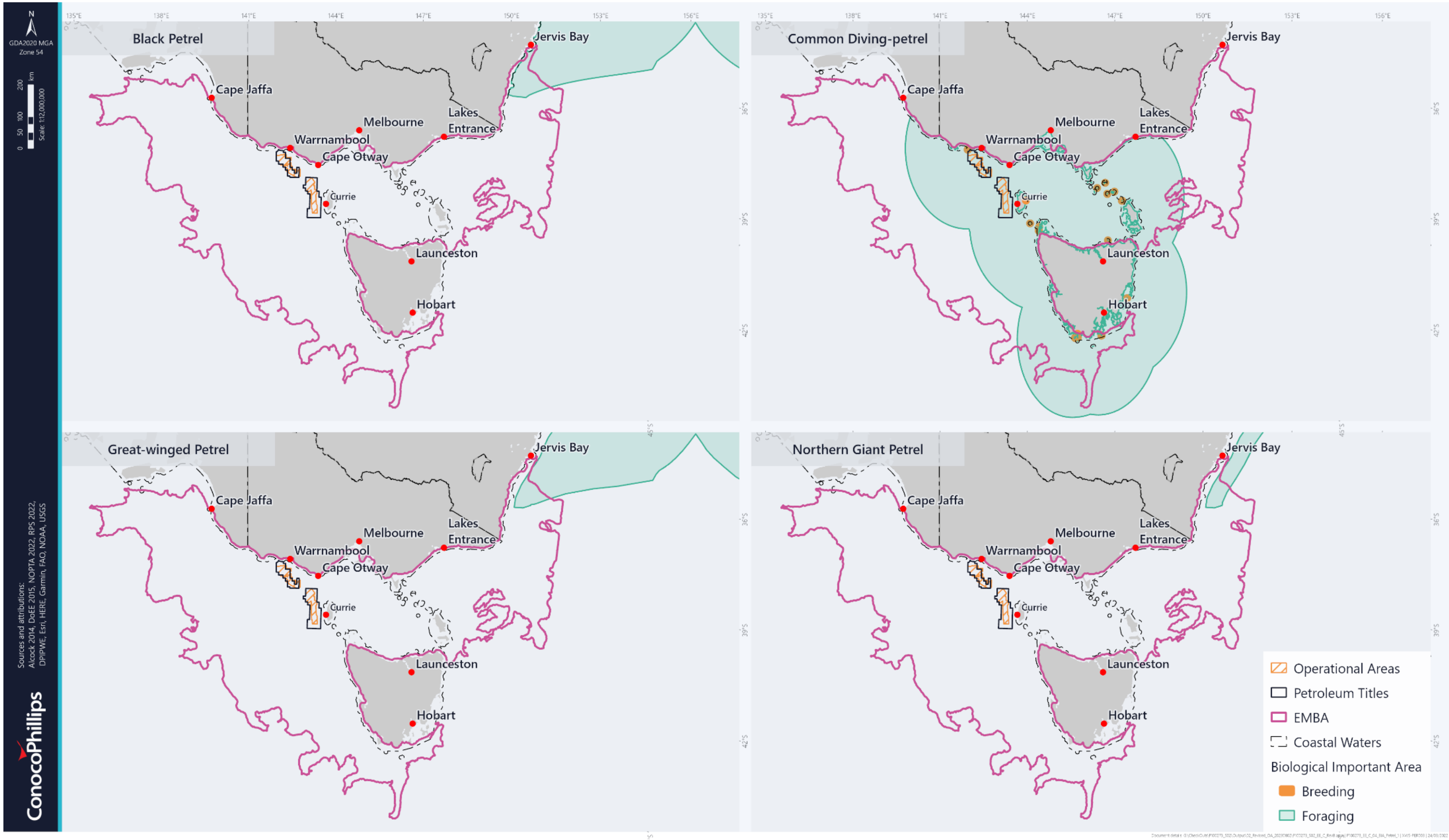


Figure 4-40: Petrel Biologically Important Areas within the EMBA

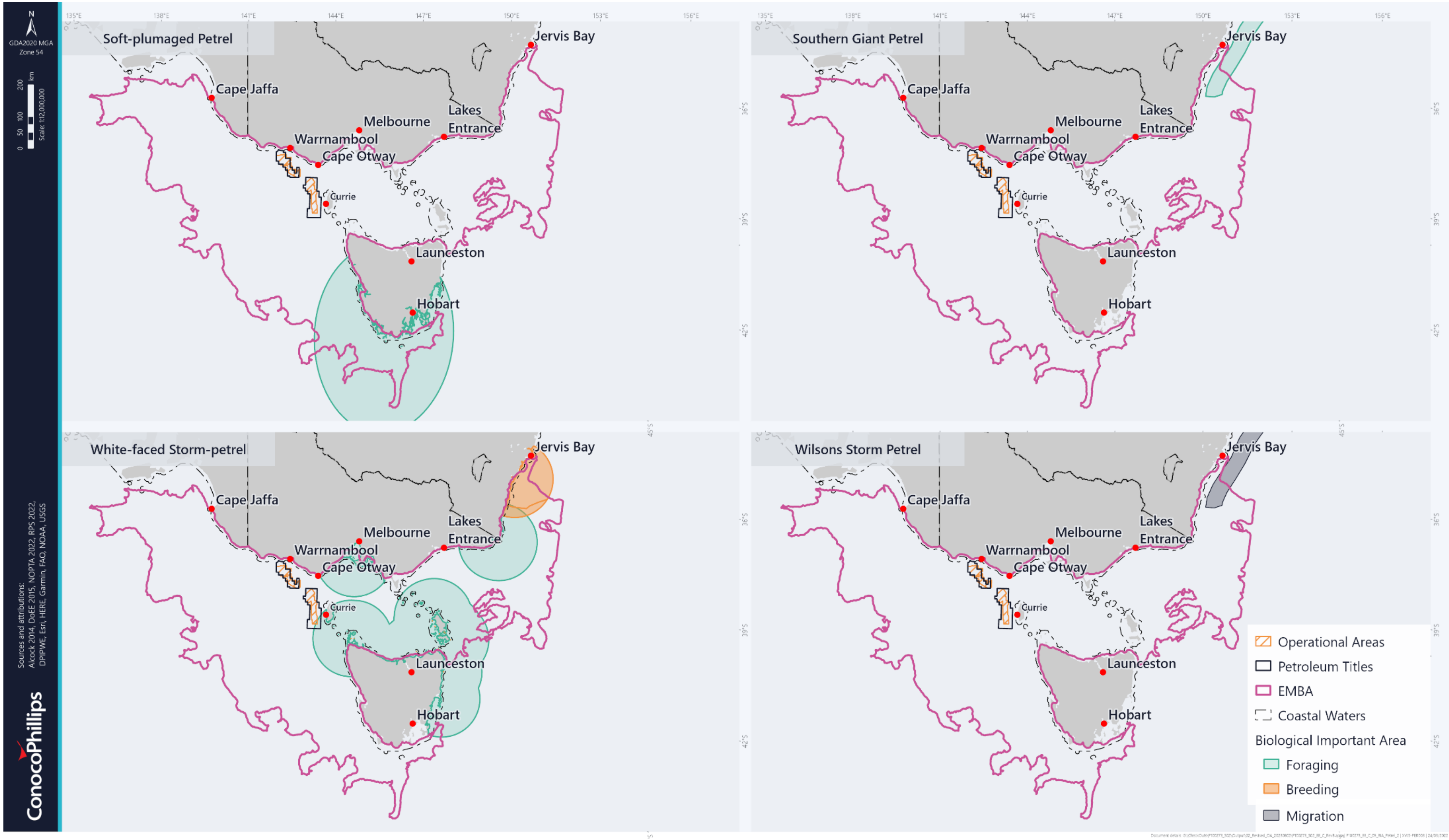


Figure 4-41: Petrel Biologically Important Areas within the EMBA

4.6.7.2. Shearwaters

Four species of shearwater (flesh-footed shearwater (*Ardenna carneipes*), short-tailed shearwater (*Ardenna tenuirostris*), sooty shearwater (*Ardenna grisea*), wedge-tailed shearwater (*Ardenna pacifica*)) may occur within the operational areas and EMBAs. The sooty shearwater (Vulnerable) is the only one of these species identified as threatened under the EPBC Act but it does not have any . However, the operational areas and EMBA spatially overlap BIAs for two other species of shearwaters as shown in Figure 4-42.

All of the shearwater species listed are managed under the Wildlife Conservation Plan for Seabirds (DCCEEW 2020). There are a range of anthropogenic threats that affect the shearwater family which may vary based on species, stocks and life history stage. Pertinent threats relating to the activity include climate change, marine pollution, and mortality and injury arising from interactions with commercial fishing activities (DCCEEW 2020). In addition, the short-tailed shearwater, fledglings in particular, appear to have an increased sensitivity to artificial light although fewer than 1% of fledglings produced annually are thought to be affected by mortality (DCCEEW 2020). The relationship between bird species and their sensitivity to artificial light is discussed in Section 6.4.5.1.

The **flesh-footed shearwater** (*Ardenna carneipes*) (EPBC Act: Marine, Migratory) is recognised as a conservation value in the temperate east (DSEWPaC 2012a). They are a trans-equatorial migrant widely distributed across the south-western Pacific during breeding season (early September to early May) and is a common visitor to the waters of the continental shelf/slope and occasionally inshore waters. The species breeds in burrows on sloping ground in coastal forest, scrubland, shrubland or grassland, the majority of which lie off the coast of southern WA, with the remaining being Smith Island (SA) and Lord Howe Island (NSW). The flesh-footed shearwater feeds on small fish, cephalopod molluscs (squid, cuttlefish, nautilus and argonauts), crustaceans (barnacles and shrimp), other soft-bodied invertebrates (such as Velella) and offal. The species forages almost entirely at sea and very rarely on land. It obtains most of its food by surface plunging or pursuit plunging. It also regularly forages by settling on the surface of the ocean and snatching prey from the surface 'surface seizing'), momentarily submerging onto prey beneath the surface ('surface diving') or diving and pursuing prey beneath the surface by swimming ('pursuit diving'). Birds have also been observed flying low over the ocean and pattering the water with their feet while picking food items from the surface (termed 'pattering') (DoE 2022). A foraging BIA for the flesh-footed shearwater intercepts with the EMBA (Figure 4-42).

The **short-tailed shearwater** (*Ardenna tenuirostris*) has a foraging BIA (September to May) within the routine light and flaring EMBAs and breeding BIAs overlapped by the flaring EMBA (Figure 4-42) and is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). The short-tailed shearwater migrates to the Northern hemisphere for the austral winter and is generally only present in Australian waters from September to May. They are common in the South-east Marine Region and largely found on numerous islands off Victoria and Tasmania during breeding (Baker and Hamilton 2013; Skira et al. 1996). During breeding they conduct a bimodal feeding strategy, alternating short foraging trips to local waters with long foraging trips (up to 17 days) to the Polar Frontal Zone. Short trips allow greater chick provisioning at the sacrifice of body condition, which is then recovered in richer subantarctic waters. Diet includes fish (particularly myctophids), crustaceans and squid (Weimerskirch and Cherel 1998). Feeding occurs in flocks of up to 20,000 birds, and it has been seen associated with cetaceans.

The short-tailed shearwater, also known as a muttonbird, is one of few Australian native birds that is harvested to this day (DNRET 2019). Mutton birding is a cultural, non-commercial, and commercial activity allowed for in reserves (excluding Nature Reserves) and private land in Tasmania (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54). The season runs from the 27 March to 30 April each year when chicks are taken for their feathers, flesh and oil (DNRET 2019). To this day, muttonbird harvesting is an important part of Aboriginal culture in Tasmania (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346). Commercial sheds are located on Babel, Chappell, Big Dog and Trefoil Islands all off Tasmania’s north-west coast.

The **sooty shearwater** (*Ardenna grisea*) (EPBC Act: Vulnerable, Marine, Migratory) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). It nests on islands and headlands in large colonies. Burrows are dug for breeding under tussock grass and low scrub. Birds typically do not return to their natal colonies until age four. They feed on fish, crustacea and cephalopods, caught while diving. Short (1–3 days) and long (5–15 days) provisioning trips are made by parents; longer trips allow foraging along the Antarctic Polar Front, reducing competition close to breeding grounds and allowing vast colonies to persist (Birdlife, 2013). The Australian total population is now estimated to be less than 1,000 pairs (Garnett et al. 2011). Breeding populations are known on Tasman Island, Hippolyte Rock, Maatsuyker Island and Courts Island. These and associated substantial foraging areas are recognised as BIAs for the species and overlap the EMBA (Figure 4-42).

The **wedge-tailed shearwater** (*Ardenna pacifica*) is recognised as a conservation value in the temperate east (DSEWPaC 2012a). They have a foraging BIA (August to May) within the operational areas and EMBAs (Figure 4-42). This BIA is associated with mainland breeding locations and represents a 160 km buffer around each breeding area. Movement patterns of the wedge-tailed shearwater are poorly known but populations at the northern and southern extremities of the known range are migratory, departing nests in early April to early May and spending the non-breeding season in the tropics (DoE 2022). In Australia, wedge-tailed shearwaters have been observed feeding along the junction between inshore and offshore water masses. There is no detailed analysis of the diet of Australian adult wedge-tailed shearwaters, however tropical residing wedge-tailed shearwater birds are known to mostly consume fish, some cephalopods, insects, jellyfish and prawns (DoE 2022). Food is taken by contact-dipping, dipping, surface-seizing and, rarely, deep-plunging up to 2 m deep (DoE 2022).

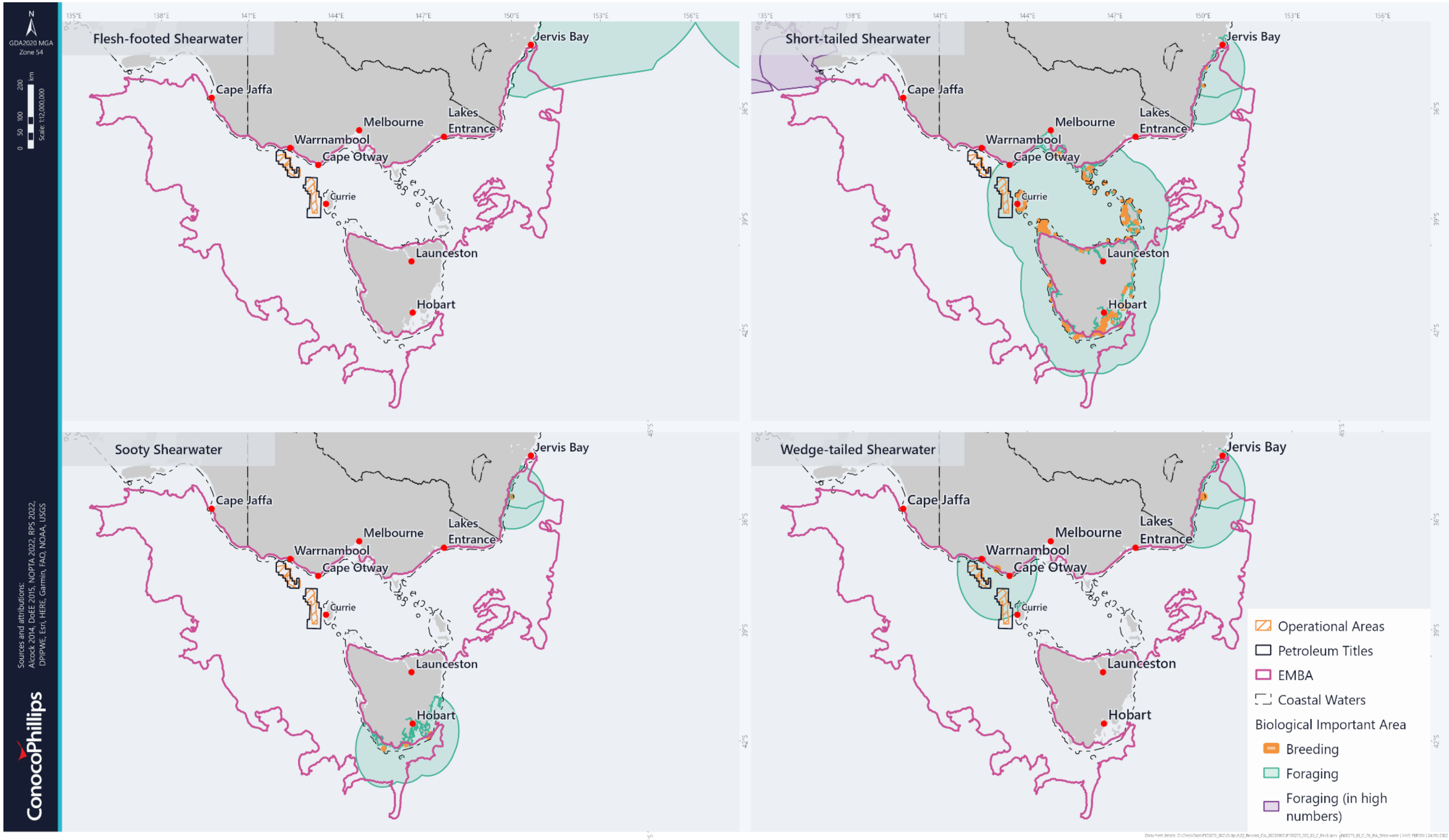


Figure 4-42: Shearwater Biologically Important Areas within the EMBA

4.6.7.3. Migratory Shorebirds

Australia is a geographically and ecologically important location for migratory shorebirds within the East Asian Australasian Flyway (EAAF), as the vast majority of Australian migratory shorebird species breed in the northern hemisphere and migrate annually to southern nonbreeding areas, including Australia (DoEE 2017). Species are mostly present in Australia during the non-breeding period, from as early as August to as late as April/May each year. These important habitats in Australia allow adult birds to build up the energy reserves necessary to support northward migration and subsequent breeding. While in Australia, migratory shorebirds need to maintain an energy intake greater than in the Northern Hemisphere given the additional energy expenditure required to recover from the southward migration, to allow moulting and replacement of worn feathers, and to build fat reserves in preparation for the northward migration (DoE 2015d). As such relative amounts of time spent feeding and resting, and distances between feeding and roosting areas, are important factors in the energy budgets of individual shorebirds (DoEE 2017). This high energy demands on migratory shorebirds resulting from their migratory lifecycle means that resting is critical when not breeding.

The **eastern curlew** (*Numenius madagascariensis*) (EPBC Act: Critically Endangered, Marine, Migratory) is one of Australia's largest shorebirds and a long-haul flyer migrating to Australia from Russia and north-eastern China. Eastern curlews are found on islands in Bass Strait and along the north-west, north-east, east and south-east coasts of Tasmania and within the EMBA (DCCEEW 2023a). The species is found on intertidal mudflats and sandflats, often with beds of seagrass on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons and is rarely seen inland (Birdlife Australia 2020). Specific threats to this species in Australia include habitat loss, fragmentation and degradation from development, anthropogenic disturbance at feeding and roosting sites, pollution and changes to hydrological regimes (DCCEEW 2023a).

The **red knot** (*Calidris canutus*) (EPBC Act: Vulnerable, Marine, Migratory) and **great knot** (*Calidris tenuirostris*) (EPBC Act: Vulnerable, Marine, Migratory) breed in the northern hemisphere (eastern Siberia) and undertake migration along the EAAF to spend summer in Australasia. Both are widespread along the coasts of Australia. The red knot is more commonly seen across the NSW and Victoria coasts is a regular visitor to the coasts of Tasmania, King and Flinders Islands, with the closest site of international importance being Corner Inlet, Victoria (within the EMBA). The red knot is a medium-sized wader that prefers sandy beach, mudflats and estuary habitats, where they feed on bivalve molluscs, snails, worms and crustaceans (Birdlife Australia 2020). The great knot inhabits intertidal mudflats and sandflats in sheltered coasts including bays, harbours and estuaries. They forage on moist mud, and often roost on beaches or in nearby low vegetation, such as mangroves or dune vegetation. Habitat loss, fragmentation and degradation are key threats to knot species, as well as anthropogenic disturbance at feeding and roosting sites, hydrological changes, marine pollution and climate change.

There are four EPBC Act-listed **sandpiper species** (common sandpiper (*Actitis hypoleucos*), sharp-tailed sandpiper (*Calidris acuminata*), curlew sandpiper (*Calidris ferruginea*), pectoral sandpiper (*Calidris melanotos*)) that may occur within the operational areas and EMBA. Sandpipers are small wader species found in coastal and inland wetlands, particularly in muddy estuaries, feeding on small marine invertebrates (Birdlife Australia 2020). Sandpipers breed in Europe and Asia and migrate to Australia during the southern summer (Birdlife Australia 2020). The Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015d) notes that threats to species such as sandpipers include habitat loss and modification, climate change, and mortality and injury arising from interactions with commercial fishing activities.

The **curlew sandpiper** (*Calidris ferruginea*) (EPBC Act: Critically Endangered, Marine, Migratory) is a common visitor during the Australian summer, congregating in large flocks, sometimes comprising thousands of birds, at sheltered intertidal mudflats and also at the muddy margins of terrestrial wetlands (Birdlife Australia 2020). They often mix with other species of shorebirds, pecking at invertebrates on the surface of the mud or making shallow probes below its surface, sometimes wading in belly-deep water while probing. Feeding becomes more intense as migration time approaches, with birds fuelling up for their long flight back to their breeding grounds in Siberia. Up to 1,800 Curlew Sandpipers are known to congregate to feed at the Gippsland Lakes, Victoria (within the EMBA). In Tasmania, they are recorded on King Island and the Furneaux Group (within the EMBA).

4.6.7.4. Terns

There are seven EPBC Act-listed **tern species** (Caspian tern (*Hydroprogne caspia*), little tern (*Sternula albifrons*), fairy tern (*Sternula nereis*), Australian fairy tern (*Sternula nereis nereis*), greater crested tern (*Thalasseus bergii*), white fronted tern (*Sterna striata*) and sooty tern (*Onychoprion fuscatus*)) that may occur within the operational areas and EMBA. Terns are slender, lightly built birds with long, forked tails, narrow wings, long bills, and relatively short legs. Many of the tern species present along the southern Australian coastline are widespread and occupy beach, wetland and grassland habitats. Terns rarely swim; they hunt for prey in flight, dipping to the water surface or plunge-diving for prey (Flegg 2002) usually within sight of land for fish, squid, jellyfish and sometimes crustaceans (DEWHA 2007). There are few identified potential threats to the species in Australia including habitat disturbance, climate changing in relation to changing sea temperature and oil spills where the proximity of oil facilities poses a risk to breeding habitat.

The **greater crested tern** (*Thalasseus bergii*) is recognised as a conservation value in the temperate east (DSEWPaC 2012a). This species has distinctive features; large size, shaggy crest, yellow bill and can be found on islands and coastlines of tropical and subtropical areas from South Africa to Australia (DCCEEW 2020). The species breeds in large colonies, in small groups or amidst colonies of other species. Nests are shallow scrape in bare sand, rock or coral in flat open sites on offshore islands, low-lying coral reefs, sandy or rocky coastal islets, coastal spits, lagoon mudflats or islets in saltpans and sewage works (Del Hoyo et al. 1996). Outside the breeding season it can be found at sea throughout its range, with the exception of the central Indian Ocean. A foraging and breeding BIA for the greater crested tern intercepts with the EMBA (Figure 4-43).

The **white-fronted tern** (*Sterna striata*) is recognised as a conservation value in the south-east (DoE 2015b). They are a medium sized 'commic' tern endemic to Australasia breeding in New Zealand and on Flinders and Cape Barren Island off the north-east coast of Tasmania (DCCEEW 2020). It is also a winter visitor to Australia, from south Queensland to Tasmania and west to South Australia. This species can be found in coastal areas, nesting on rocky or sandy beaches and shingle islands in rivers, also on coastal cliffs and deserted barges, often close to the surf (DCCEEW 2020). The white-fronted tern often feeds in flocks and in winter it feeds over oceanic waters and feeds almost exclusively on fish, but will also take shrimp, feeding in the surf zone or several km out to sea (DCCEEW 2020). A foraging and breeding BIA for the white-fronted tern intercepts with the EMBA (Figure 4-43).

The **Caspian tern** (*Hydroprogne caspia*) is recognised as a conservation value in the south-west and north marine regions (DoE 2022). This species is the largest tern in Australia and has many distinctive features including lack of a deeply forked tail, a red bill with a dusky tip and long, slender swept back wings. Within Australia, the Caspian tern is widely distributed across both coastal and inland habitat and is present all year round. During the non-breeding period, the Caspian tern usually occurs individually or in small groups, however larger groups (30 birds or more) are occasionally seen at roosting sites or rich fishing grounds. This species is predominantly found in muddy or sandy sheltered coastal bays and forages in wetlands, rivers, lakes and coastal waters (DoE 2022). The Caspian tern usually forages early to mid-morning, primarily feeding on fish but also aquatic invertebrates, carrion, the young and eggs of other birds, earthworms and flying insects. A foraging BIA for the Caspian tern intersects the EMBA (Figure 4-43).

The **fairy tern** (*Sternula nereis*) is small in size compared to other terns, white and grey in colour with a black cap and a yellow-brown bill. The fairy tern has a wide geographical distribution and can be found in Australia, New Caledonia, and New Zealand (Birdlife International 2023b). Three subspecies have been identified based on these geographical differences. Within Australia, the fairy tern is found across the coastline of WA, Tasmania, Victoria and South Australia, generally breeding between mid to late October to February (Birdlife International 2023b). This species nests and breeds on sandy beaches below vegetation but above the high tide line on protected coastlines. The fairy tern forages over shallow waters and feeds primarily on feeding predatory fish. A foraging BIA for the fairy tern intercepts with the EMBA (Figure 4-43).

Figure 4-43: Tern Biologically Important Areas within the EMBA

4.6.7.5. Other Marine Listed Species

The **Australasian gannet** (*Morus serrator*) is recognised as a conservation value in the south-east (DoE 2015b). They are large seabirds that are confined to the waters around Australian and New Zealand. Breeding occurs seasonally (October to May) in colonies found off the coast of Victoria, Tasmania and New Zealand, nesting on the ground in small but dense colonies (DCCEEW 2020). Their diet consists of pelagic fish, but also squid and garfish. Prey is caught mainly by plunge-diving but the species is also seen regularly attending trawlers. The main threat facing Australasian gannets is bycatch due to longline and set-net fisheries (DCCEEW 2020). A foraging BIA and an aggregation BIA for the Australasian gannet intercepts with the EMBA (Figure 4-44).

The **black-faced cormorant** (*Phalacrocorax fuscescens*) is recognised as a conservation value in the south-east (DoE 2015b). They are a large seabird that is endemic to southern Australia and is mostly found along the coasts of Tasmania and Victoria (DCCEEW 2020). Breeding normally occurs on rocky islands, but also on stacks, slopes and sea cliffs in colonies of up to 2,500 individuals (del Hoyo et al 1992). It feeds in coastal waters, sometimes in sheltered places in bays and islets and can even be found entering rivers along the coast (DCCEEW 2020). No specific threats due to human disturbance have been observed in recent years however, it is noted that oil spills and entanglement due to marine debris pose a risk to individuals (DCCEEW 2020). A foraging and breeding BIA for the black-faced cormorant intercepts with the EMBA (Figure 4-44).

The **swift parrot** (*Lathamus discolor*) (EPBC Act: Critically Endangered, Marine) is a small parrot that has rapid, agile flight. During summer, it breeds in colonies in blue gum forest of south-east Tasmania. Infrequent breeding also occurs in north-west Tasmania. The entire population migrates to the mainland for winter. On the mainland it disperses widely and forages on flowers and psyllid lerps in eucalypts. The birds mostly occur on inland slopes, but occasionally occur on the coast (TSSC 2016). Key threats to the swift parrot include predation and habitat loss and alternation. Given its habitat preferences, this species is unlikely to occur within the EMBA other than overflying it and are likely to occur in the light/flaring EMBAs during migration.

The **hooded plover (eastern)** (*Thinornis rubricollis rubricollis*) (EPBC Act: Vulnerable, Marine) is a stocky, medium-sized wading bird about 20 cm long and approximately 100 g in mass (TSSC 2014). The hooded plover (eastern) is widely dispersed on or near sandy beaches in south-eastern Australia. Its range extends from Jervis Bay in NSW to Fowlers Bay in South Australia, and includes Tasmania and various offshore islands such as Kangaroo Island, King Island and Flinders Island (Marchant & Higgins 1993; Garnett et al. 2011). The hooded plover (eastern) inhabits ocean beaches, particularly wide beaches backed by dunes with large amounts of seaweed, creek mouths and inlet entrances. It may also occur on near-coastal saline and freshwater lakes and lagoons, tidal bays and estuaries, on rock platforms, or on rocky or sandy reefs close to shore (Marchant & Higgins 1993; Garnett et al. 2011). It is largely sedentary with 95% moving over distances of less than 20 km, however, is able to travel up to 330 km, based on mainland banding studies (TSSC 2014). No biological important areas exist for this species. Threats listed for the hooded plover (eastern) include crushing or disturbance by human activity, oil spills, predation and coastal erosion (TSSC 2014).

Figure 4-44: Gannet, Cormorant and Gull Biologically Important Areas within the EMBA

The **orange-bellied parrot** (*Neophema chrysogaster*) (EPBC Act: Critically Endangered, Marine) is endemic to south-eastern Australia and listed as Critically Endangered. It is a ground feeding parrot which breeds in south-west Tasmania in summer and over winters on the coast of south-east mainland Australia (DELWP 2016). Birds arrive in Tasmania's south west in early October and depart after the breeding season usually in March and April (TSS 2021). Pairs are not known to produce more than one brood in a breeding season and low breeding participation by females (i.e. not breeding in all years) has been implicated in notable population declines (2000-2010). The 2023-24 breeding season showed a record number of 81 orange-bellied parrots return to breeding grounds, up from the previous seasons record of 77 (NRE Tasmania 2024) and includes the return of 24 wild born and 6 captive-bred juveniles from the previous season. Production of 59 fledglings occurred in the 2022/23 season just shy of the 60 fledglings born in the 2021/22 season, which is the third highest fledgling production since 2004 (DPIPWE 2022; DPC 2023). It is estimate that a total of 139 individuals would have migrated north from the breeding grounds at the end of the 2022/23 breeding season of which 81 returned for the 2023/24 breeding season resulting in a 58% return rate (DPC 2023). After breeding, migrating birds move northwards up the west coast of Tasmania via King Island to the mainland during autumn (Holdsworth 2006) (Figure 4-45). The southward migration tends to be rapid (Stephenson 1991), while northward migration in autumn across western Bass Strait is more prolonged (Higgins 1999).

In Victoria, the orange-bellied parrot mostly occurs in sheltered coastal habitats, such as bays, lagoons and estuaries or, rarely, saltworks. Given its habitat preferences, this species is not expected to occur within the operational areas, other than overflying it and the light EMBA during migrations (Figure 4-45). The parrot’s breeding habitat is restricted to south-west Tasmania, where breeding occurs from November to mid-January mainly within 30 km of the coast (Brown and Wilson 1980). During winter, on mainland Australia, orange-bellied parrots are found mostly within 3 km of the coast (DELWP 2016). Current knowledge suggests that habitat loss and degradation, particularly in the non-breeding range, has driven the decline in orange-bellied parrots (DELWP 2016). With low breeding participation by females (2000-2010) exacerbated population decline and may be a consequence of low food availability due to loss or inappropriate management of habitat, or the impacts of drought on habitat condition (DELWP 2016).

During consultation it was identified that the orange-bellied parrot is listed as one of the attributes that contribute to the Tasmanian Wilderness World Heritage Area’s Outstanding Universal Value (Org ID: 524, Wilderness Society, Event ID: 4359, FB ID: 470), which represents, and protects, much of this species breeding range.

There is no identified BIA for this species that intersects with the operational areas, light EMBA or broader EMBA. Figure 4-45 shows the likely occurrence of habitat within the operational areas.

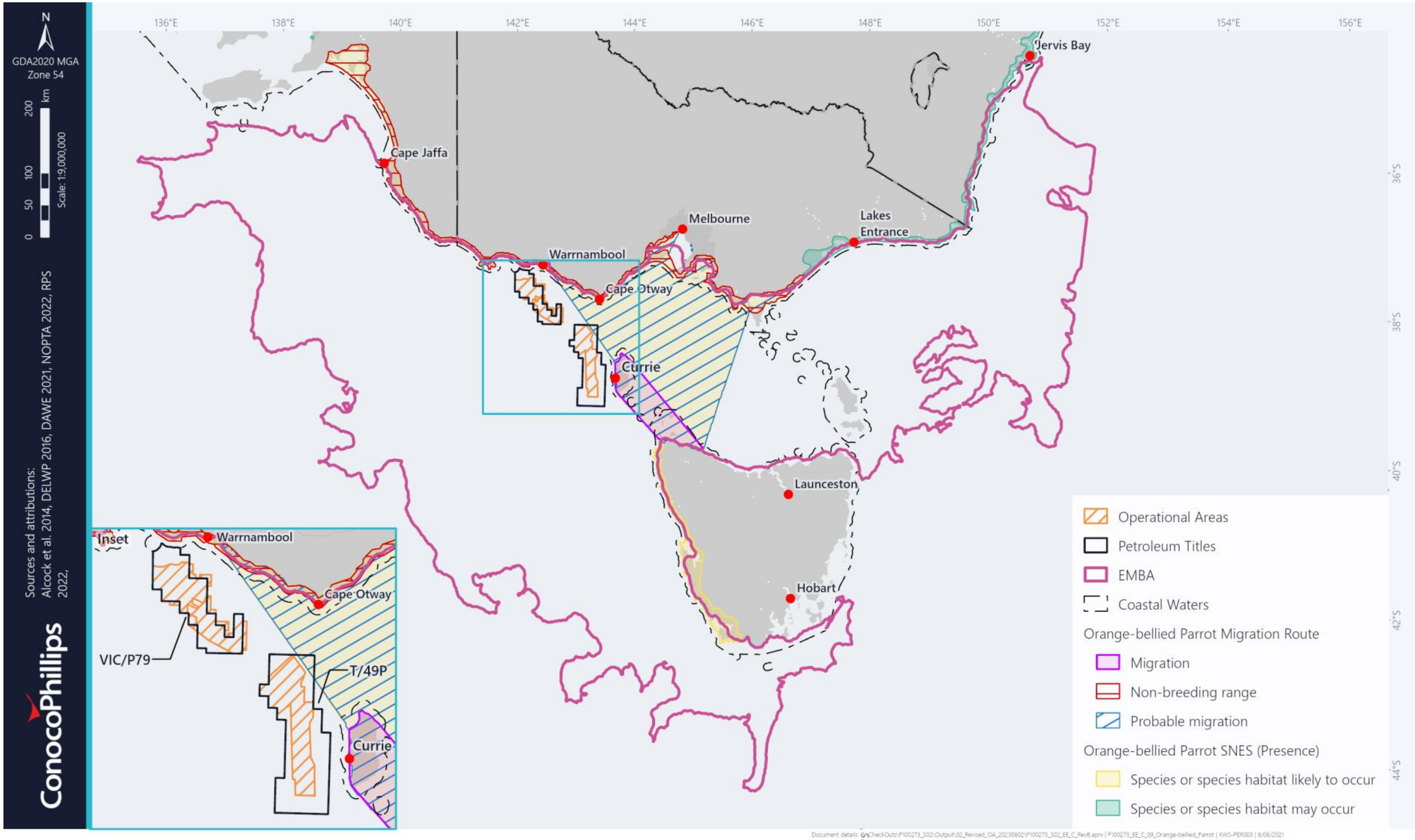


Figure 4-45: Orange bellied parrot Biologically Important Areas within the EMBAs

The **little penguin** (*Eudyptula minor*) is recognised as a conservation value in the south-east and temperate east (DoE 2015b; DSEWPaC 2012a). They have a coastal water habitat and is known to exhibit a wide foraging range with individuals able to spend weeks away at sea (McCutcheon et al. 2011), foraging for fish, squid, krill and small crustaceans among the waves (Gales and Green 1990). Little penguins occur along the southern edge of mainland Australia, as well as Tasmania, New Zealand and the Chatham Islands (McCutcheon et al. 2011). There are many little penguin colonies along the Victorian coast and their size varies considerably from six to 35,000 birds at Pyramid Rock and Gabo Island respectively. One of Australia's largest little penguin colonies of approximately 26,000 breeding individuals exist on the Summerland Peninsula, Phillip Island.

A foraging BIA (representing a 10 km foraging around known aggregation sites) overlapping the EMBA was identified around New Year and Christmas Islands, as well as parts of King Island and Tasmania (NCVA 2021). Although the population is considered stable in Australia, one colony in Manly, NSW is protected as an endangered population (NPWS 2000). Other colonies are noted at Lady Julia Percy Island (Deen Maar) and Middle Island located approximately 17 and 20 km from VIC/P79, respectively. [Paragraph updated in response to Matter: B02].

Key threats to little penguins are mortality and injury arising from interactions with commercial fishing activities, oil pollution and mortality through collisions with watercraft. Additionally, the impact of changing oceanic conditions appears to impact food availability and reproductive success (DCCEEW 2020). During consultation it was identified that the Middle Island Little Penguin colony is threatened by a range of processes including human resource use and predation by introduced canids; however, recent declines in the colony are not necessarily linked to canid predation (Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 3860; FB ID: 154; Event ID: 2690, FB ID: 143). This colony is located approximately 20 km from the closest point of the VIC/P79 operational area.

In the wild the species will live up to an average of 7 years and start reproducing annually at approximately 3 years old (DPE 2019). Little penguins form a long-term monogamous pair bond with a separation rate of about 18% and will return to their colonies to reconstruct old burrows. Little penguins are known to breed throughout southern Australia from Western Australia to New South Wales, including Bass Strait and Tasmania. Most little penguins stay at sea throughout autumn and winter, although some will return frequently to their burrows all year round. Breeding season varies in different parts of the country but occurs sometime between September and February, with male penguins building nests to attract a mate (Gales and Green 1990). A breeding colony exists within the EMBA at Christmas Island, close to King Island, from September – February with some birds residing at the colony all year round (NCVA 2021).

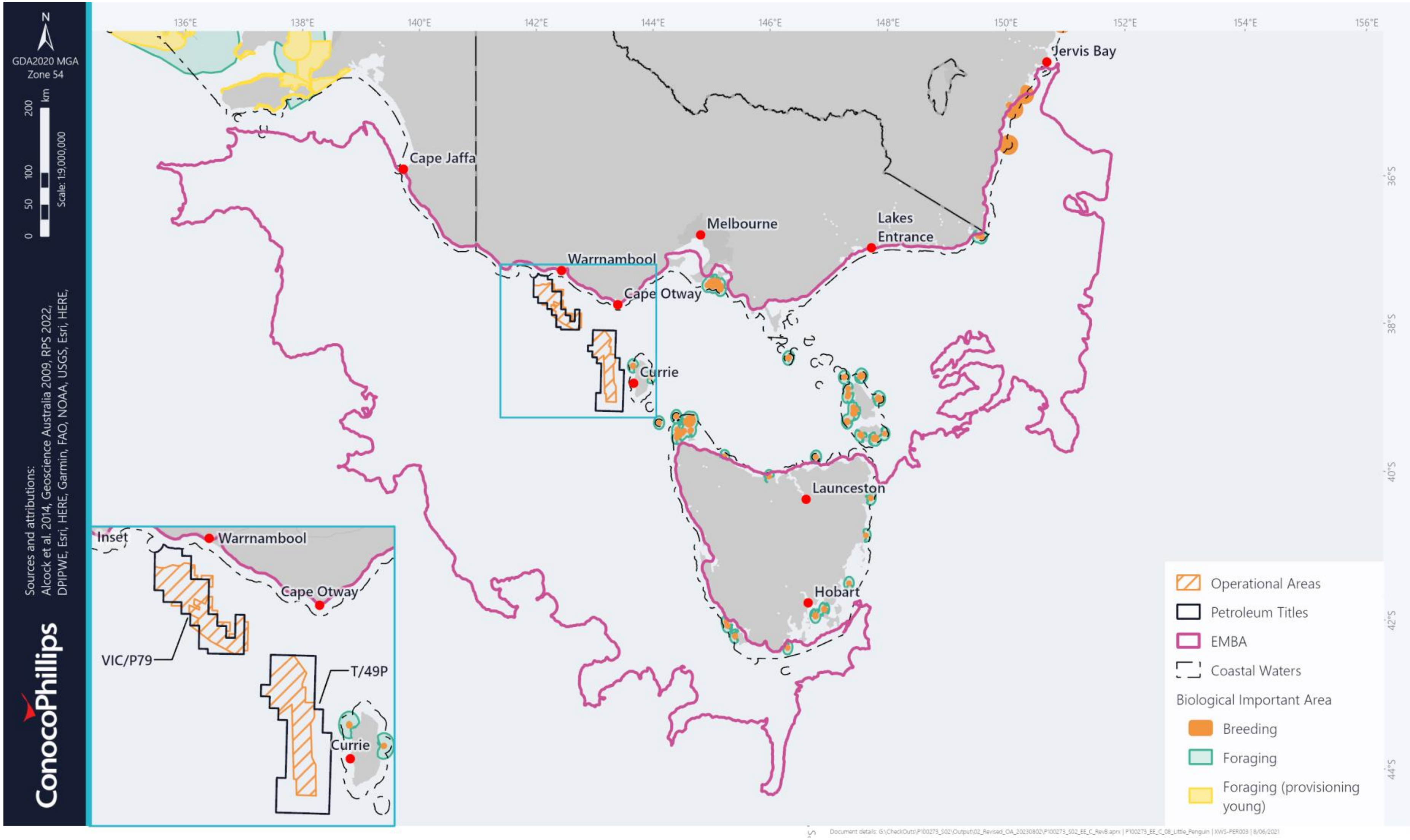


Figure 4-46: Little penguin Biologically Important Areas within the EMBA

4.6.8. Marine Reptiles

Marine reptiles are a group of reptiles that have become secondarily adapted to life wholly or partially in the marine environment. Marine reptiles are classified into 4 different taxonomic groups: marine turtles (or sea turtles), sea snakes, marine iguana, saltwater crocodiles. Species from 3 of these groups (marine turtles, sea snakes, saltwater crocodiles) are found in Australian waters. Some reptile species are listed as threatened and/or migratory under the EPBC Act 1999, and these are considered a matter of national environmental significance. Species may also be protected under state (and territory) environmental legislation.

The EPBC Act PMST report lists 5 species of reptiles with the potential to occur within the EMBAs (Table 4-12; Appendix B). All 5 of the reptile species are marine turtles and all have an EPBC threatened status. Two are Endangered (loggerhead turtle (*Caretta caretta*) and the leatherback turtle (*Dermochelys coriacea*)) with the remaining 3 listed as Vulnerable (green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*) and flatback turtle (*Natator depressus*)).

There were no BIAs identified for marine reptiles within the relevant EMBAs. Further, there are no nesting or interesting areas identified as habitat critical to the survival of marine turtles identified in the waters of southern Australia (CoA 2017a).

The Victorian Biodiversity Atlas (VBA) database identified no sightings of marine reptiles within the operational areas and sightings of only 3 species, the green turtle, loggerhead turtle and the leatherback turtle, within the EMBA (DELWP 2022). ConocoPhillips Australia identified a single leatherback turtle within the T/49P operational area during a marine mammal survey on 2 December 2022. The presence of most species within the relevant EMBAs and are expected to be of a transitory nature only. Marine turtles have a highly migratory life history and rely on both marine and terrestrial habitats.

The yellow-bellied sea snake (*Pelarnis platurus*) is known to be present in waters off the Victorian coast; however, sea snakes are not expected to be encountered within the relevant EMBAs and were not identified in the PMST search.

The turtle species identified in Table 4-12 and described below are managed under the Recovery Plan for Marine Turtles in Australia (CoA 2017a). There are a range of anthropogenic threats that affect Australian marine turtles which may vary based on species, stocks and life history stage. Key threats include climate change and variability, marine debris, chemical and terrestrial discharge, fisheries bycatch, light pollution, vessel disturbance and sound interference (CoA 2017a). Due to the absence of identified BIAs, including the identification that there is no habitat critical to the survival of marine turtles in the waters of southern Australia the presence of individuals is expected to only be of a transient nature.

The **loggerhead turtle** (*Caretta caretta*) (EPBC Act: Endangered, Marine, Migratory) is globally distributed in sub-tropical waters (Limpus 2008a), including those of eastern, northern and western Australia (CoA 2017a), and are rarely sighted off the Victorian coast. The main Australian breeding areas for loggerhead turtles are generally confined to southern Queensland and WA (Cogger et al. 1993). Loggerhead turtles will migrate over distances in excess of 1,000 km but show a strong fidelity to their feeding and breeding areas (Limpus 2008a).

Loggerhead turtles are carnivorous and feed predominantly on benthic invertebrates up to 55 m offshore. No known loggerhead foraging areas have been identified in Victorian waters although foraging areas have been infrequently identified in waters off SA (CoA 2017a). The CoA (2017a) maps the loggerhead turtle as having a known or likely range within Bass Strait, but given this species' preference for sub-tropical waters, it is unlikely to be encountered. The VBA has recorded 2 sightings of the loggerhead turtle within the EMBA with the latest sighting in 2013 (DELWP 2022).

Table 4-12: Marine reptile species that may occur within the relevant EMBAs, and protection status

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Sound EMBA <2 km	Light 20 km	Flaring 50 km	MDO (MOD)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Caretta caretta	Loggerhead turtle	E	✓	✓	LO	LO	LO	BLO	KO	FKO	FKO	FKO	Recovery Plan for Marine Turtles in Australia 2017-2027
Chelonia mydas	Green turtle	V	✓	✓	MO	MO	MO	MO	MO	KO^{T} FKO^{VS} MO^{VN}	FKO^{T} FKO^{VS} KO^{VN}	FKO	
Dermochelys coriacea	Leatherback turtle	E	✓	✓	KO^{T} LO^{VS} LO^{VN}	KO^{T} LO^{VS} LO^{VN}	KO^{T} LO^{VS} LO^{VN}	FKO^{T} KO^{VS} BLO^{VN}	FKO^{T} KO^{VS} KO^{VN}	FKO	FKO	FKO	
Eretmochelys imbricata	Hawksbill turtle	V	✓	✓	-	-	-	-	-	KO^{T} FKO^{VS} LO^{VN}	FKO^{T} FKO^{VS} LO^{VN}	FKO	
Natator depressus	Flatback turtle	V	✓	✓	-	-	-	-	-	LO^{VS}	KO^{T} BLO^{VS}	FKO	
Threatened Species: V – Vulnerable E –Endangered	Type of presence: MO–- Species or species habitat that may occur within the area LO–- Species or species habitat likely to occur within area KO–- Species or species habitat known to occur within area BLO – Breeding likely to occur within area FKO – Foraging, feeding or related behaviour known to occur within area				Operational Area: T – T/49P VS – VIC/P79 Southern extent VN – VIC/P79 Northern extent	✓ = Listed Migratory/Marine species *= Matter of National Environmental Significance Source: PMST; Appendix B [Table updated in response to Matter: I06].							

The **green turtle** (*Chelonia mydas*) (EPBC Act: Vulnerable, Marine, Migratory) is distributed in sub-tropical and tropical waters around the world and primarily forage on algae, seagrass and mangroves (Limpus 2008b; CoA 2017a). In Australia, they nest, forage and migrate predominantly across tropical northern Australia with more limited numbers in NSW, Victoria and SA. There are no known nesting or foraging grounds for green turtles in Victoria, and they occur only as rare vagrants (CoA 2017a). The DAWE (2020d) maps the green turtle as having a known or likely range within Bass Strait, with 3 sightings of the species recorded in the EMBA with the latest sighting in 2017 (DELWP 2022).

The **leatherback turtle** (*Dermochelys coriacea*) (EPBC Act: Endangered, Marine, Migratory) is widely distributed throughout tropical, sub-tropical and temperate waters of Australia (CoA 2017a), including in oceanic waters and continental shelf waters along the coast of southern Australia (Limpus 2009). More so than other marine turtle species, the leatherback turtle utilises cold water foraging areas, with the species most commonly reported foraging along the coastal waters of central eastern Australia (southern Queensland to central NSW), south-east Australia (Tasmania, Victoria and eastern SA), and southwestern WA (Limpus 2009). Leatherback turtles are more commonly found foraging in Australian waters along the east coast and in Bass Strait. The southern waters of Australia are one of five identified foraging sites (where area restricted behaviour occurs) for leatherback turtles (CoA 2017a).

Leatherbacks feed on soft-bodied invertebrates, including jellyfish (Limpus 2009). No major nesting has been recorded in Victoria or Tasmania, with isolated nesting recorded in the Northern Territory, Queensland and northern NSW (CoA 2017a). The DAWE (2020d) maps the leatherback turtles as having a known or likely range within Bass Strait, and a migration pathway in southern waters with the VBA documenting 4 sightings of the species in the EMBA with the latest sighting in 2017 (DELWP 2022). ConocoPhillips Australia identified a single leatherback turtle within the T/49P operational area during a marine mammal survey on 2 December 2022. The waters of the EMBA do not represent critical habitat for the species, though it is possible it may occur in low numbers during upwelling.

The **hawksbill turtle** (*Eretmochelys imbricata*) (EPBC Act: Vulnerable, Marine, Migratory) is widely distributed in the tropical and subtropical waters of Australia. Their eggs are laid on warm beaches with the most important nesting sites for the species located in northern Queensland, north-east Arnhem Land and WA (CoA 2017a). Adult hawksbill turtles are primarily found in tropical reefs where they are usually seen resting in caves and ledges or otherwise feeding on sea sponge, soft corals or other soft-bodied invertebrates.

No major nesting sites have been recorded in Victoria or Tasmania; however the CoA (2017a) maps the hawksbill turtle as having a known or likely range in eastern Bass Strait. There have been no sightings of the species recorded in the EMBA (DELWP 2022).

The **flatback turtle** (*Natator depressus*) (EPBC Act: Vulnerable, Marine, Migratory) in Australia is found only in the tropical waters of northern Australia, where it feeds on soft-bodied prey. Nesting occurs only in these tropical waters. The DAWE (2020d) maps the flatback turtle as having a known or likely range north of the Victorian/NSW border. The VBA database (DELWP 2022) does not contain any records of this species within the EMBA; however, this species could be encountered in the far eastern extent of the EMBA.

4.6.9. Marine Mammals

Marine mammals are warm blooded, breathe air through lungs, produce milk to nurse their young and live in the marine environment for all or part of their life. Marine mammal taxonomic groups found in Australian waters includes cetaceans (whales, dolphins, porpoises), pinnipeds (seals, sea lions, walruses) and sirenians (manatees, dugongs). Some mammal species are listed as threatened and/or migratory under the EPBC Act 1999, and these are considered a matter of national environmental significance. Species may also be protected under state (and territory) environmental legislation.

The EPBC Act PMST report lists 39 species of marine mammal with the potential to occur within the operational areas (T/49P and VIC/P79 divided in to northern and southern extents), light EMBAs and LOWC EMBAs (Table 4-13; Appendix B). Six of the 39 marine mammal species have an EPBC threatened status, including 3 endangered species (blue whale (*Balaenoptera musculus*), southern right whale (*Eubalaena australis*) and Australian sea lion (*Neophoca cinerea*)) and 3 vulnerable species (sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), and the southern elephant seal (*Mirounga leonine*)). [Section updated in response to Matter: M11].

The EPBC Act PMST report also identified that EMBAs overlap BIAs for the Australian sea lion, blue whale, southern right whale, humpback whale (*Megaptera novaeangliae*), and the Indian Ocean bottleneck dolphin (*Tursiops aduncus*) which are displayed in Figure 4-48, Figure 4-52, Figure 4-53, Figure 4-56 and Figure 4-58 respectively.

Table 4-13: Marine mammal species that may occur within relevant EMBAs, and protection status

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Sound EMBA <3.59 km	Sound EMBA <22.8 km*	MDO (Mod)	MDO (Low)	LOWC (mod)	EMBA	EPBC Management Plans
Low Frequency (LF) Cetaceans												
Balaenoptera acutorostrata	Minke whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Balaenoptera bonaerensis	Antarctic minke whale, Dark-shoulder minke whale	-	✓	-	LO	LO	LO	LO	LO	LO	LO	-
Balaenoptera borealis	Sei whale	V	✓	-	FLO^{T} FLO^{VS} FKO^{VN}	FLO^{T} FLO^{VS} FKO^{VN}	FLO^{T} FLO^{VS} FKO^{VN}	FLO^{T} FKO^{VS} FKO^{VN}	FKO	FKO	FKO	Approved Conservation advice *Balaenoptera borealis* (sei whale)
Balaenoptera edeni	Bryde's whale	-	✓	-	-	-	-	-	MO	MO	LO	-
Balaenoptera musculus	Blue whale	E	✓	-	FKO	FKO	FKO	FKO	FKO	FKO	FKO	Conservation Management Plan for the Blue Whale
Balaenoptera physalus	Fin whale	V	✓	-	FLO^{T} FLO^{VS} FKO^{VN}	FLO^{T} FLO^{VS} FKO^{VN}	FLO^{T} FLO^{VS} FKO^{VN}	FLO^{T} FKO^{VS} FKO^{VN}	FKO	FKO	FKO	Approved Conservation advice *Balaenoptera physalus* (fin whale)
Caperea marginata	Pygmy right whale	-	✓	-	FMO^{T} FMO^{VS} FLO^{VN}	FMO^{T} FMO^{VS} FLO^{VN}	FMO^{T} FMO^{VS} FLO^{VN}	FMO^{T} FLO^{VS} FLO^{VN}	FLO	FLO	FLO	-
Eubalaena australis	Southern right whale	E	✓	-	KO	KO^{T} KO^{VS} BKO^{VN}	KO^{T} BKO^{VS} BKO^{VN}	KO^{T} BKO^{VS} BKO^{VN}	BKO	BKO	BKO	Conservation Management Plan for the Southern Right Whale Draft National Recovery Plan for the Southern Right Whale (*Eubalaena australis*)
Megaptera novaeangliae	Humpback whale	-	✓	-	KO^{T} LO^{VS} LO^{VN}	KO^{T} LO^{VS} LO^{VN}	KO^{T} LO^{VS} LO^{VN}	KO	FKO^{T} FKO^{VS} KO^{VN}	FKO^{T} FKO^{VS} KO^{VN}	FKO	-
High Frequency (HF) Cetaceans												
Hyperoodon planifrons	Southern bottlenose whale	-	-	-	-	-	-	-	MO	MO	MO	-
Berardius arnuxii	Arnoux's beaked whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Delphinus delphis	Common dolphin, Short-beaked common dolphin	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Globicephala macrorhynchus	Short-finned pilot whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Globicephala melas	Long-finned pilot whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Grampus griseus	Risso's dolphin, Grampus	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Mesoplodon bowdoini	Andrew's beaked whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Mesoplodon densirostris	Blainville's beaked whale, Dense-beaked whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Mesoplodon hectori	Hector's beaked whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Mesoplodon layardii	Strap-toothed beaked whale, Strap-toothed whale, Layard's beaked whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Mesoplodon mirus	True's beaked whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Orcinus orca	Killer whale, Orca	-	✓	-	LO	LO	LO	LO	LO	LO	LO	-
Physeter macrocephalus	Sperm whale	-	✓	-	MO	MO	MO	MO	MO^{T} MO^{VS} FKO^{VN}	MO	MO^{T} MO^{VS} FKO^{VN}	-
Pseudorca crassidens	False killer whale	-	-	-	LO	LO	LO	LO	LO	LO	LO	-
Tursiops truncatus s. str.	Bottlenose dolphin	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Ziphius cavirostris	Cuvier's beaked, Goose-beaked whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Lagenorhynchus obscurus	Dusky dolphin	-	✓	-	LO	LO	LO	LO	LO	LO	LO	-
Lissodelphis peronii	Southern right whale dolphin	-	-	-	MO	MO	MO	MO	MO	MO	MO	-

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Sound EMBA <3.59 km	Sound EMBA <22.8 km*	MDO (Mod)	MDO (Low)	LOWC (mod)	EMBA	EPBC Management Plans
Mesoplodon grayi	Gray's beaked whale, Scamper down whale	-	-	-	MO[VN]	MO[T] MO[VN]	MO[T] MO[VN]	MO	MO	MO	MO	-
Tursiops aduncus	Indian Ocean bottlenose dolphin, Spotted bottlenose dolphin	-	-	-	-	LO[VN]	LO[VS] LO[VN]	LO	LO	LO	LO	-
Mesoplodon ginkgodens	Gingko-toothed beaked whale, Gingko-toothed whale, Gingko beaked whale	-	-	-	-	-	-	-	-	-	MO	-
Tasmacetus shepherdi	Shepherd's beaked whale, Tasman beaked whale	-	-	-	-	-	-	-	MO	MO	MO	-
Very High Frequency (VHF) Cetaceans												
Kogia breviceps	Pygmy sperm whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Kogia sima	Dwarf sperm whale	-	-	-	MO	MO	MO	MO	MO	MO	MO	-
Phocoena dioptrica	Spectacled Porpoise	-	✓	✓	-	-	-	-	-	-	MO[T]	-
Pinnipeds												
Arctocephalus forsteri	Long-nosed fur-seal, New Zealand fur-seal	-	-	✓	MO	MO	MO	MO	LO[T] MO[VS] MO[VN]	LO[T] MO[VS] MO[VN]	BKO[T] LO[VS] BKO[VN]	-
Arctocephalus pusillus	Australian fur-seal, Australo-African fur-seal	-	-	✓	MO[T] MO[VS] LO[VN]	MO[T] MO[VS] LO[VN]	LO[T] LO[VS] BKO[VN]	BLO[T] LO[VS] BKO[VN]	BKO	BKO	BKO	-
Neophoca cinerea	Australian sea-lion, Australian sea lion	E	-	✓	MO[VS] MO[VN]	MO[VS] KO[VN]	MO[VS] KO[VN]	KO[VS] KO[VN]	KO	KO	KO	Conservation Advice *Neophoca cinerea* Australian sea lion
Mirounga leonina	Southern elephant seal	V	-	✓	-	-	-	-	-	-	BMO[T] BMO[VN]	Conservation Advice *Mirouga leonine* southern elephant seal
Sirenia												
Dugong dugon	Dugong	-	✓	✓	-	-	-	-	-	-	MO[T] MO[VS]	-

Threatened Species: V – Vulnerable E –Endangered	Type of presence: MO –- Species or species habitat that may occur within the area LO–- Species or species habitat likely to occur within area KO–- Species or species habitat known to occur within area BMO – Breeding may occur within area BLO – Breeding likely to occur within area BKO – Breeding known to occur within area FMO – Foraging, feeding or related behaviour may occur within area FLO – Foraging, feeding or related behaviour likely to occur within area FKO – Foraging, feeding or related behaviour known to occur within area	Operational Area: T – T/49P VS – VIC/P79 Southern extent VN – VIC/P79 Northern extent	✓Listed Migratory/Marine species * PMST presence for the Sound EMBA for marine mammals has been run on a conservative distance (<22.8 km) which encompasses the Sound Injury EMBA for marine mammals – Continuous (<3.59 km) and the Sound SRW behaviour EMBA – Impulsive (6.5 km) Source: PMST; Appendix B [Table updated in response to Matter: I06].

Table 4-14: Marine mammals biologically important areas within relevant EMBAs

Scientific Name	Common Name	Operational Area	Sound EMBA <3.59 km	Sound EMBA <22.8 km*	MDO (mod)	MDO (low)	LOWC (mod)	EMBA
Balaenoptera musculus	Blue whale	F D	F D	F D	F D	F D	F D	F D
Eubalaena australis	Southern right whale	M	M	M R[VN**]	M R	M R	M R	M R
Megaptera novaeangliae	Humpback whale	-	-	-	-	F[T, VS]	F[T, VS]	F
Physeter macrocephalus	Sperm whale	-	-	-	-	-	-	F[VN]
Tursiops aduncus	Indian Ocean bottlenose dolphin, Spotted bottlenose dolphin	-	-	-	-	B[VS]	B[T, VS]	B
Neophoca cinerea	Australian sea-lion, Australian sea lion	-	-	-	-	F[VN]	F[VS, VN]	F

Biologically Important Area:
(B) – Breeding
(D) – Distribution
(F) – Foraging
(M) – Migration
(R) – Reproduction

Operational Area:
T – T/49P
VS – VIC/P79 Southern extent
VN – VIC/P79 Northern extent
* PMST presence for the Sound EMBA for marine mammals has been run on a conservative distance (<22.8 km) which encompasses the Sound Injury EMBA for marine mammals – Continuous (<3.59 km) and the Sound SRW behaviour EMBA – Impulsive (6.5 km). Source: PMST; Appendix B
** Within <22.8 km Sound EMBA, however this distance is only relevant in an offshore direction on the continental slope in depths <170 m

4.6.9.1. Pinnipeds

Pinnipeds are a widely distributed and represent a diverse group of carnivorous, fin-footed, semiaquatic marine mammals. They comprise the families Odobenidae (i.e. walrus), Otariidae (i.e. the eared seals, such as sea lions and fur seals), and Phocidae (i.e. the earless or true seals). The PMST for the EMBA (Appendix B) identified 4 pinniped species, 2 listed as threatened and all listed as marine. Only one species, the Australian sea-lion, has a BIA which overlaps the EMBAs, as discussed below.

The **Australian fur-seal** (*Arctocephalus pusillus*) (EPBC Act: Marine) has a relatively restricted distribution around the islands of Bass Strait, parts of Tasmania and southern Victoria with no BIAs in Bass Strait (DAWE, 2021d). There are 10 established breeding colonies of the Australian fur-seal that are restricted to islands in the Bass Strait; 6 occurring off the coast of Victoria and 4 off the coast of Tasmania (Shaughnessy, 1999). The species prefers the rocky parts of islands with jumbled terrain and boulders and prefers smoother igneous rocks to rough limestone. There are no breeding colonies or haul our sites within the operational areas. The closest breeding colonies to the operational areas are Lady Julia Percy Island and Reid Rocks (Figure 4-47) (Shaughnessy, 1999).

Colonies are occupied year-round, but activity is greatest during the summer breeding season. Adult females give birth soon after coming ashore, mate about 6 days after giving birth, and then leave the colony to feed. They alternate periods at sea feeding with shore attendance bouts suckling their pups for several months. There is considerable variation in the time of weaning. Pups begin to forage effectively in June or July, supplementing their milk diet. Most are weaned by September or October, but a small proportion continue to suckle into their second year (Shaughnessy, 1999). Juvenile seals feed primarily in oceanic waters beyond the continental shelf, lactating females feed in mid-outer shelf waters (50-100 km from the colony) and adult males forage in deeper waters (Shaughnessy, 1999).

New Zealand fur-seals (*Arctocephalus forsteri*) (EPBC Act: Marine; Listed as Rare under Tasmanian legislation) are mostly found in central South Australian waters (Kangaroo Island to South Eyre Peninsula, outside the EMBA) 77% of their population is found here (Shaughnessy, 1999). The closest breeding colonies to the operational areas are located at Lady Julia Percy Island and Cape Bridgewater (Figure 4-47). [Section updated in response to Matter: M27].

The **Australian sea-lion** (*Neophoca cinerea*) (EPBC Act: Endangered, Marine) is endemic to southern Australia and has a core range stretching from Kangaroo Island (SA) to the Houtman Abrolhos Islands (WA) (TSSC 2020c). However, the species has also been recorded along the NSW coast, southern Tasmania and Victoria as it is known to forage in Commonwealth waters adjacent to core states (TSSC 2020c). This species will dive continually while at sea and feed on a variety of prey ranging from cephalopods to fish, sharks and seabirds (DoE 2022). A foraging BIA for this species overlaps the EMBA (Figure 4-48).

Australian sea-lions regularly visit haul-out sites (rest stops), during the non-breeding season, and breeding sites (rookeries). Onshore habitats are typically remote sections of coastline and include exposed islands and reefs, rocky terrain, sandy beaches and even caves or deep cliff overhangs (DoE 2022). Australian sea lions exhibit high site fidelity and there is little to no interchange of females between breeding colonies (DoE 2022). There are no known breeding colonies of the Australian sea-lion within the EMBA.

Conservation advice from the Threatened Species Scientific Committee (TSSC) indicates that interactions with commercial fishing and entanglement in fisheries-related marine debris are key threats to the species (2020c). Specifically, demersal gillnet fisheries are understood to be one of the primary threats to the Australian sea-lion. Other threats that have the potential to impact Australian sea-lions are oil spills, noise emissions and climate change resulting in sea level and temperature rise (TSSC 2020c).

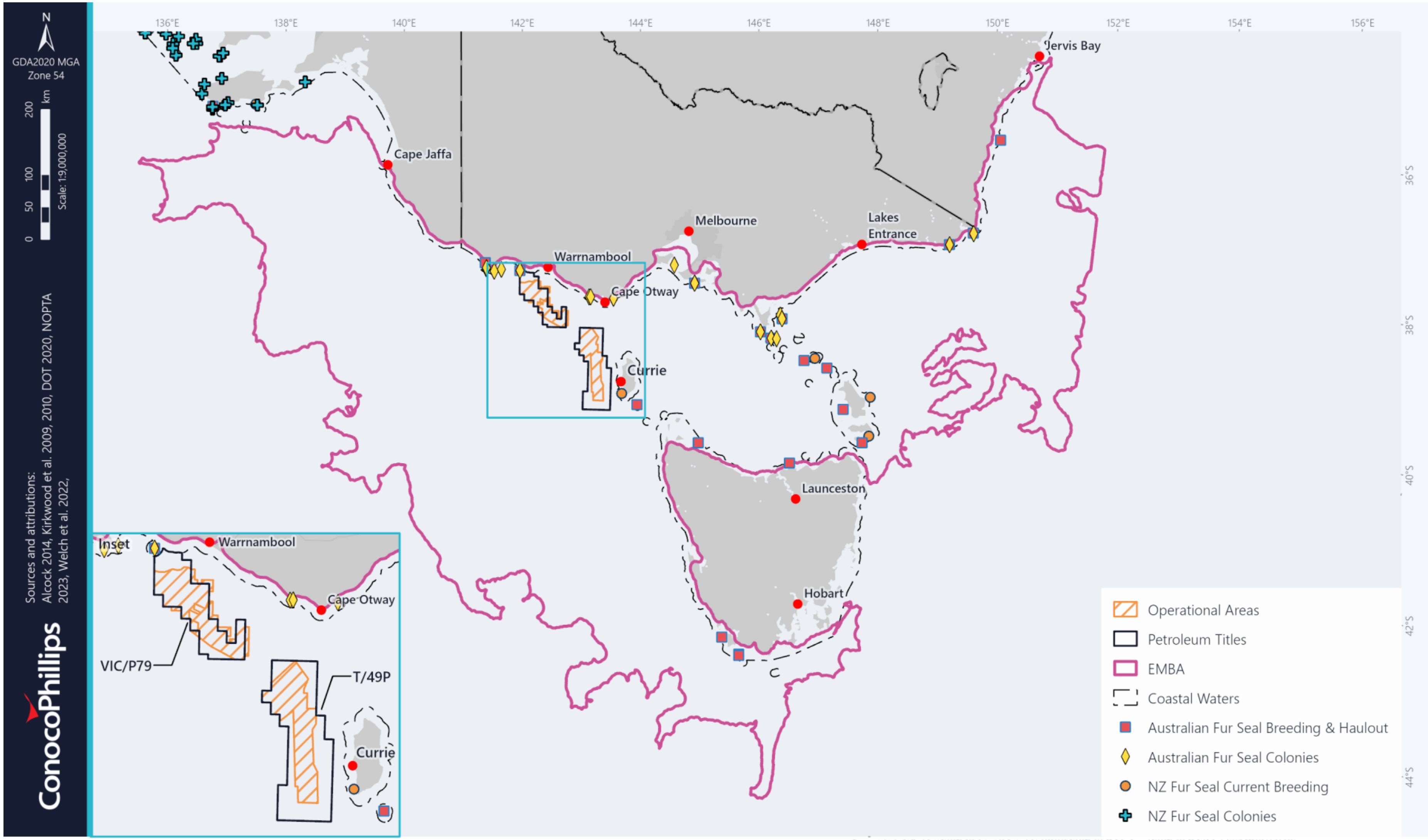


Figure 4-47: Australian and New Zealand Fur Seal Colonies and Breeding sites within the EMBA

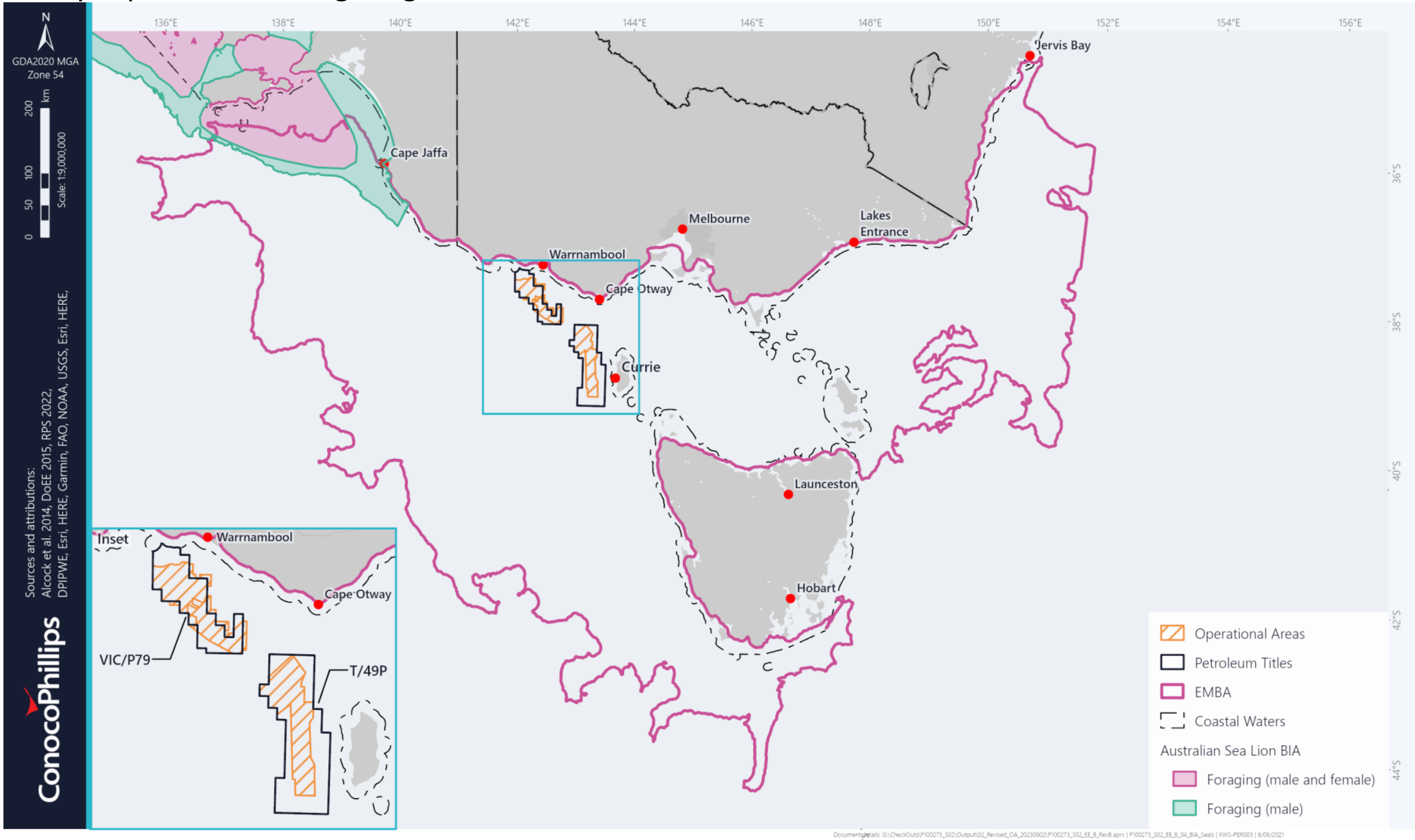


Figure 4-48: Australian sea-lion Biologically Important Areas within the EMBA

4.6.9.2. Cetaceans

Cetaceans are a group of marine mammals that include whales, dolphins and porpoises. Cetaceans are inherently generally wide-ranging species that migrate and feed across large areas and, therefore, may be present at any location within the EMBA. Between 2021 and 2023 ConocoPhillips Australia commissioned an aerial surveillance program for marine mammals within petroleum titles T/49P and VIC/P79 (Appendix P). Twelve cetacean species were conclusively identified during aerial surveys, with blue whales, humpback whales and sperm whales being the most commonly sighted species. See Appendix P for further results of the marine mammal aerial surveillance program. [Section updated in response to Matter: M05].

The PMST for the EMBA (Appendix B) identified 34 cetacean species, 4 listed as threatened and 12 as migratory. There are 4 species of cetaceans which have BIAs overlapping the EMBA, as discussed below.

The **blue whale** (*Balaenoptera musculus*) (EPBC Act: Endangered; listed Migratory) is present in waters off Australia's Antarctic Territory and is widespread in all Australian waters at various times of the year (DoE 2022). The species is oceanic and appears to undertake extensive migrations between warm water (low latitude) breeding areas and cold-water feeding grounds during summer between approximately 20°S and 60-70°S (Bannister et al. 1996; DoE 2015b). Migration pathways are not known however it is thought the species migrates to Antarctic waters in early summer and leaves in autumn migrating to tropical breeding areas (Indonesian and possibly south-west Pacific waters) during winter (DoE 2022). Blue whales have extensive, global migration patterns that are not known to follow particular coastlines or oceanographic features (Bannister et al. 1996). Exact breeding ground locations are also not known (Bannister et al. 1996) however it is thought a region in deep oceanic waters around the Indonesian archipelago may be significant (DoE 2022). There are two subspecies of blue whales that use Australian waters (including Australian Antarctic waters), the pygmy blue whale (PBW) (*B. m. brevicauda*) and the Antarctic blue whale (*B. m. intermedia*) (DoE 2015b).

The conservation management plan for the blue whale reveals many anthropogenic threats to the species (DoE 2015). The relevance of these threats to the two subspecies varies depending on the habitats that they occupy, the timing of habitat occupancy and their population abundance and trend. Threats include accidental mortality and injury arising from vessel disturbance and strike, climate change and variability and sound interference (DoE 2015). Underwater sound covers a range of frequencies and the way in which a species is impacted will depend on the proximity to the source, hearing sensitivity of the whale, intensity of source and its frequency spectrum and the behavioural state of the whale. The impacts of sound pollution on the blue whale are detailed in Section 6.

PBW are not known to migrate as far south (to approximately 55°S) as the Antarctic blue whale (Bannister et al. 1996). While Antarctic blue whales appear to feed mainly, if not exclusively, in the Antarctic, PBW feed in more temperate latitudes. It is therefore likely that records of blue whales feeding in Australian waters are PBW (DEH 2005b).

The PBW feeds on pelagic crustaceans (zooplankton including krill, salps and copepods) (DoE 2022). Key feeding areas within Australian waters for the PBW are the Bonney Upwelling system and adjacent waters off South Australia and Victoria and the Perth Canyon off WA (Figure 4-49). Photo-identification has confirmed this movement as PBW travel between the Bonney Upwelling and Perth Canyon feeding areas (Garcia-Rojas et al. 2018). The continental shelf area between Robe and Cape Otway is also a foraging area with high annual use where the PBW feed on abundant swarms of coastal krill (*Nyctiphanes australis*) nourished by the Bonney Upwelling, a seasonal event where nutrient rich cold waters are pushed to the surface from the deeper ocean (DoE 2015b). PBW occupy the western area of the Bonney Upwelling system in the Eastern Great Australian Bight and adjacent to the Kangaroo Island canyons from November and December, then move south-east to the Bonney Upwelling system off eastern South Australia and Victoria (between Robe, SA and Cape Otway, Vic) from January to April and then decrease between May and June (Commonwealth of Australia 2015c). ConocoPhillips Australia commissioned aerial surveys along designated transects through T/49P and opportunistic sighting while traversing VIC/P79 from July to October 2021; and along designated transects through VIC/P79, along the shelf break between VIC/P79 and T/49P and along a transect through T/49P between August 2022 and May 2023 (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 49; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 393). A full report of sightings which occurred along the transect between 2022 and 2023 can be found in Appendix P: Cetacean Surveillance Program Report. [Section updated in response to Matter: M08]. Key observations include:

- The arrival of small numbers of blue whales, presumed to be PBWs, in the Otway Basin/western and central Bass Strait in September (two in T/49P in 2021) and October (two in T/49P in 2021, one in VIC/P79 in 2022 and two in central Bass Strait in 2022)
- Peak numbers of blue whales within the survey area in March and April 2023, and
- A significant decrease in blue whale numbers in May 2023.

Additional observations recorded during sightings indicate:

- Presence of extensive areas of dense surface krill swarms across the survey areas with only some of these areas being utilised by whales
- General observations early in the season (September to November) indicating some blue whales to be in poor to moderate body condition (with body condition scoring based on methods described in Wachtendonk et al. 2022), and
- Observations through peak season (December – April) showed the majority of blue whales to be feeding in the survey area and in moderate to good body condition.

Satellite tagged individuals have been tracked migrating north from the Perth Canyon to Indonesian waters almost to the equator, the likely breeding area for this population (Branch et al. 2007; Gales et al. 2010; Double et al. 2014: cited in Garcia- Rojas et al. 2018). The PBW distribution around Australia is provided in Figure 4-49; and migration pathways are provided in Figure 4-50. A distribution and foraging BIA for the pygmy blue whale intercepts with the EMBA (Figure 4-52) and is overlapped by the operational areas.

The Subtropical Front (confluence of sub-tropical and subantarctic waters between 40-45°S) is likely to be a large-scale feeding area (Mikhalev 2000; cited in DoE 2022). Satellite tagging has shown rapid movement from western and eastern Australia to the Subtropical Front – an area targeted by Soviet whalers during the 1960s (Mikhalev 2000; cited in DoE 2022) (Figure 4-51).

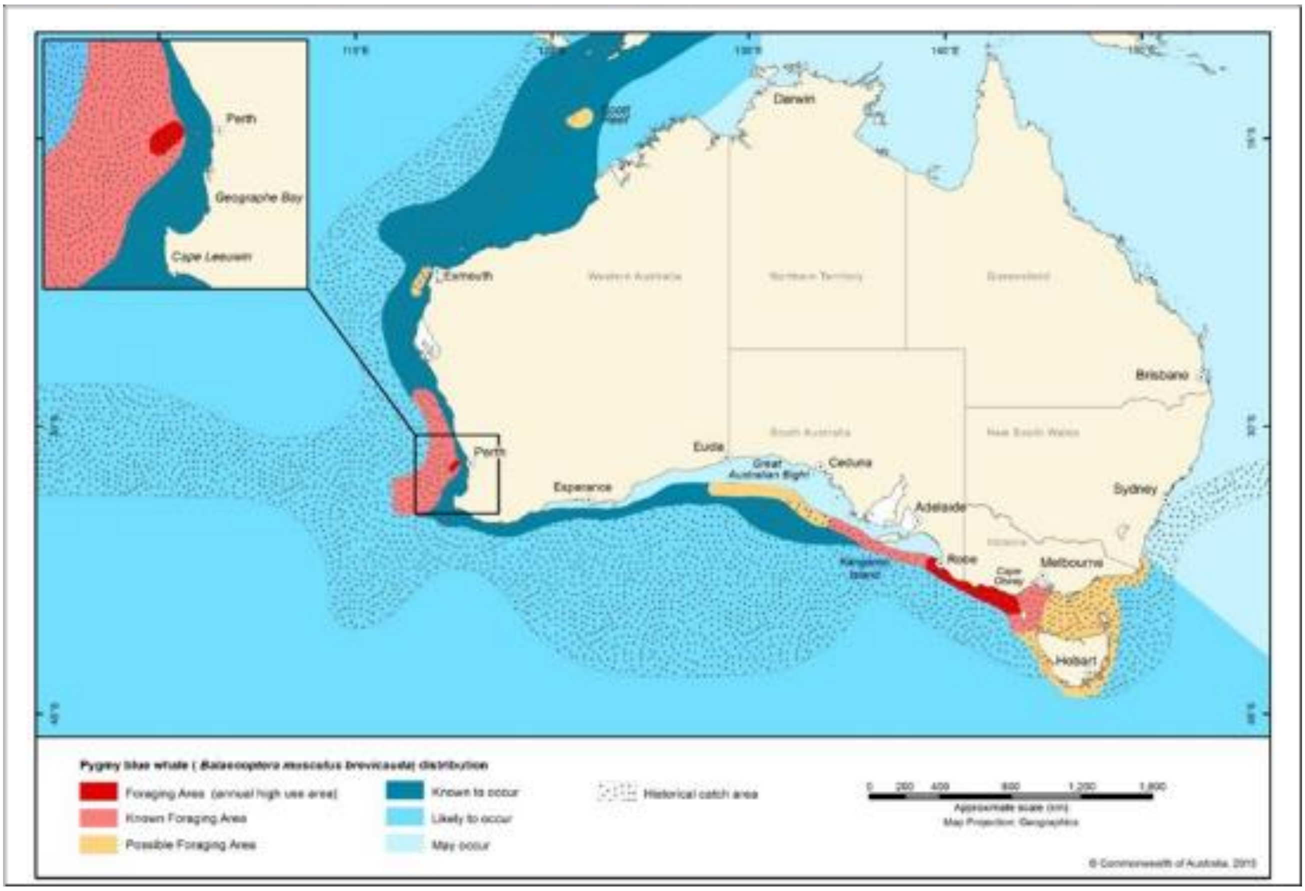


Figure 4-49: PBW Distribution around Australia

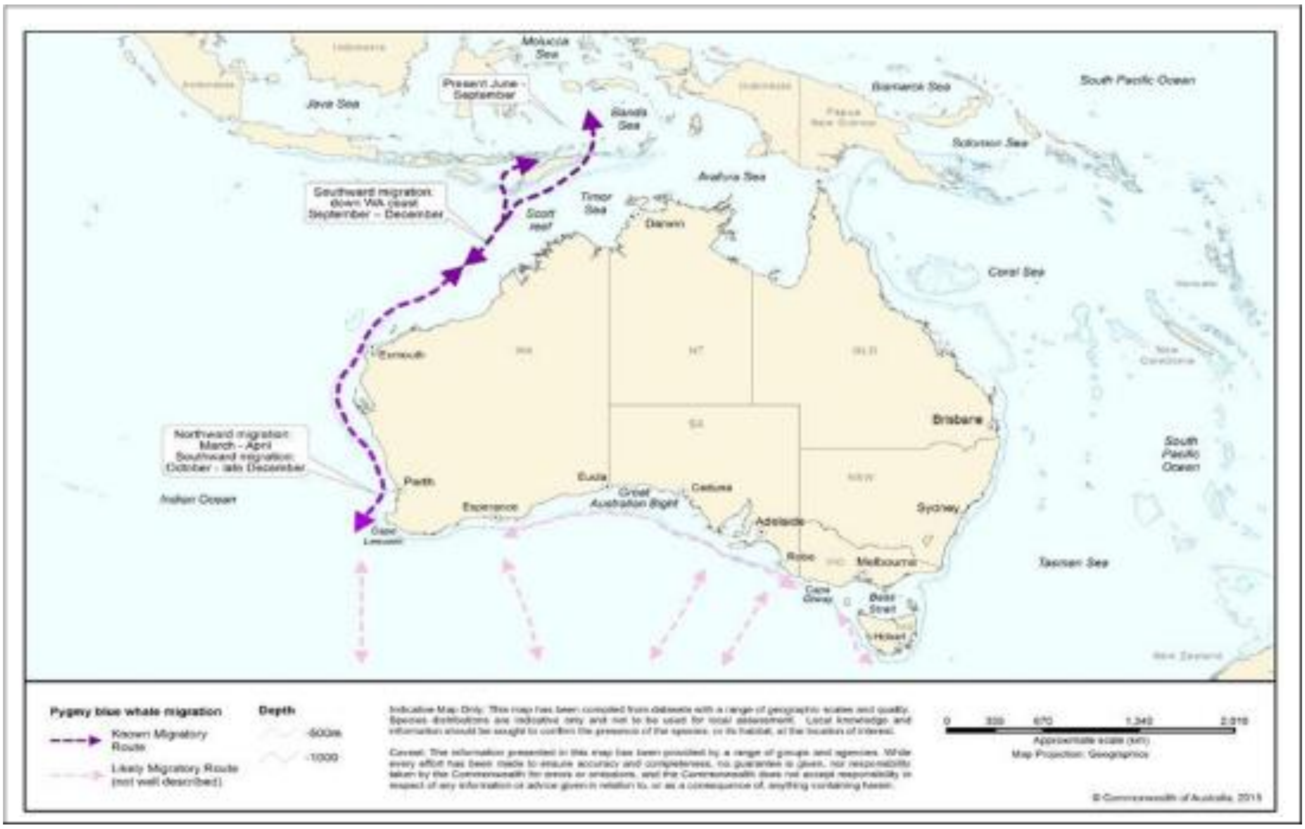
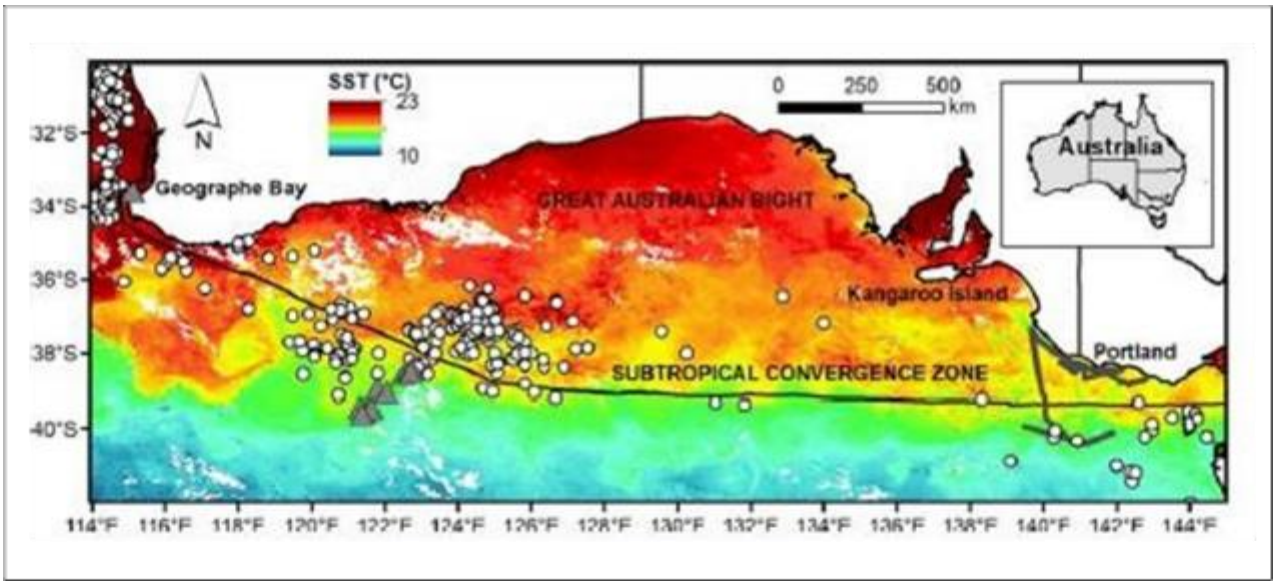


Figure 4-50: PBW Migration Routes



Source: Garcia-Rojas et al. 2018

Figure 4-51: Satellite tracking of PBW individuals in the STC zone between 4th of December 2002–31st of January 2003 (grey triangles) and historical Soviet whaling catches of PBW (white circles)

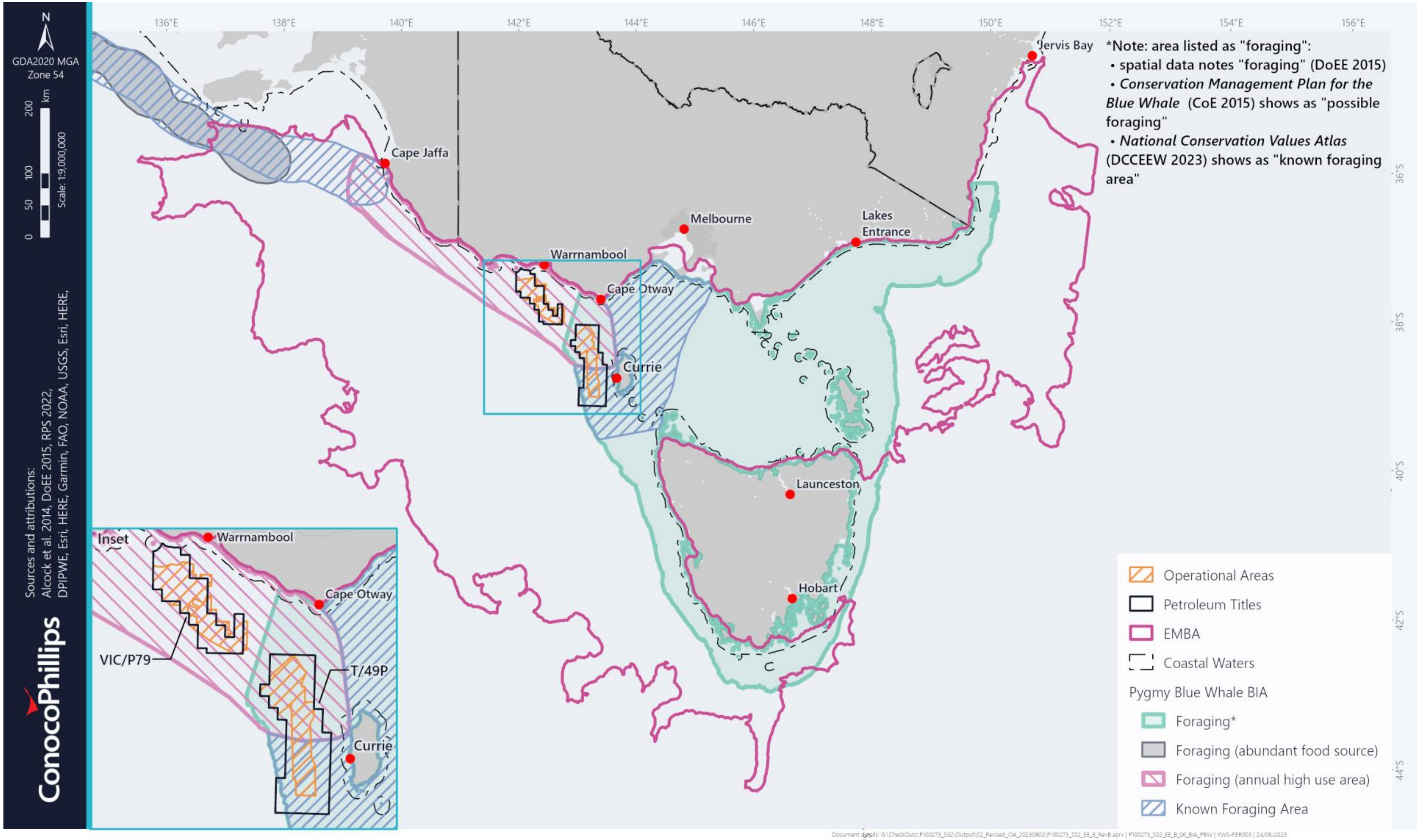


Figure 4-52: Blue whale Biologically Important Areas within the EMBA

The **southern right whale** (SRW) (*Eubalaena australis*) (EPBC Act: Endangered and Migratory) is distributed in the southern hemisphere with a circumpolar distribution between latitudes of 16°S and at least 65°S. They are seasonally present on Australia's southern coastline, distributed in the southern hemisphere between 20°S and 60°S. They generally occupy shallow sheltered bays that offer protection from south westerly weather, within 2 km of the shore and in water depth of less than 10 m (Charlton 2017). The SRW is pelagic in summer, foraging in the open Southern Ocean (Bannister et al. 1996) between 32° and 65°S, with their main feeding areas thought to occur between 40°S and 65°S (DSEWPaC 2012b). They migrate from the subantarctic to southern Australian coastal waters to calve and mate (Mustoe and Ross 2004). The species is regularly present on the Australian coast between early-April to early November with isolated individuals seen outside of these periods (DSEWPaC 2012b). Within the current Conservation Management Plan for the SRW (DSEWPaC 2012b) a core coastal range has been defined across the Bass Strait, including multiple coastal aggregation areas where whales occur in greater density each year. However, recent spatial data now supersedes this (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467). The National Conservation Values Atlas (2023) has spatially defined migration and reproduction BIAs for the species which occur within the EMBA (Figure 4-53), with the migration period stated as approximately April to October and reproduction period stated as May to September.

The conservation management plan for the southern right whale (DSEWPaC 2012b) identifies known threats to individuals as accidental mortality and injury arising from entanglement with marine debris, as well as vessel disturbance and strike. At the population level, threats that have the potential to impact the growth of the species include climate change and variability and sound interference (DSEWPaC 2012b). Underwater sound covers a range of frequencies and the way in which a species is impacted will depend on the proximity to the source, hearing sensitivity of the whale, intensity of source and its frequency spectrum and the behavioural state of the whale. The impacts of sound interference from the activity on the SRW are detailed in Section 6.

The peak mating period for SRW is from mid-July through to August (DoE 2022). Pregnant females generally arrive during late May/early June and depart with calves in September to October, however the general time of arrivals and departures varies on an inter-annual basis. Calving females are known to have high site fidelity and a 3 to 4 year calving interval. Calving/nursery areas appear to be exclusively coastal, either off continental land masses or oceanic islands and are occupied during late autumn, winter and early spring. Other near-shore waters connecting calving/nursery areas are also occupied at that time (DSEWPaC 2012b). In Australia, calving/nursery grounds are occupied from May to October (occasionally as early as April and as late as November). Female-calf pairs generally stay within the calving ground for 2–3 months. Other population classes stay for shorter and variable periods, moving from place to place on the coast and generally departing the coast earlier than female-calf pairs, with most having left by September (DSEWPaC 2012b). The Victorian, Tasmanian and southern NSW coastlines have been identified as reproduction BIAs for the species (NCVA 2023) (Figure 4-53).

During calving, SRWs generally remain within 2 km of the shoreline with calving occurring in waters less than 10 m deep (DSEWPaC 2012b). At Logan's Beach (Warrnambool), up to six cow/calf pairs (average 2.4) are resident per season (AMMC 2009) and tend to be resident for most of the season, whereas at other south-east Victorian sites, they appear to be transiting through and are only seen for a short time (AMMC 2009). The majority of first sightings in western Victoria occur in May (54%) and June (42%), while the majority of last sightings in western Victoria occur in September (50%) and October (38%). There may be an increasing trend towards October with the last sightings occurring in seven out of the last 10 years (SWIFFT 2022).

Coastal visitation varies between years, likely due to cohort structured breeding and environmental variability. Substantial changes in the number of whales recorded on the coast from year to year and the absence of reproductively mature females in virtually all years between calving events, indicates that not all whales migrate to the coast each year (DSEWPaC 2012b).

The winter distribution of whales not appearing on the Australian coast is unknown, and the absence of reproductively mature females indicates that this winter distribution may include offshore breeding (conception) habitat (DSEWPaC 2012b).

Foraging ecology for the species is poorly understood and observations of feeding are rare (DSEWPaC 2012b). Species have been observed feeding in the region of the Sub-Tropical Front, which is the boundary between cold subantarctic water and the Southern Ocean in the south (41-44°S), between January and December. In that region copepods are mainly consumed, whereas at higher latitudes krill is the main prey item. Coastal Australian waters are not generally used for feeding (DSEWPaC 2012b).

Individuals of the species are known to use widely separated coastal waters (200-1500 km apart) within a season, indicating substantial coast-wide movements (Kemper et al. 1997; Burnell 2001: cited in Charlton et al. 2014). The longest movements are undertaken by non-calving whales, though calving whales have also been recorded to move up to 700 km in a single season. Such movements indicate the connectivity of coastal habitat is important for the species (DSEWPaC 2012b; Charlton et al. 2014). Migration pathways between coastal Australian waters and offshore feeding grounds are not well defined (Gill et al. 2015; DSEWPaC 2012b). Exactly where whales approach and leave the coast from and to offshore areas is not well understood (DSEWPaC 2012b). A predominance of westward movements amongst long-rang photo-identification may indicate a seasonal westward movement in coastal habitat (DSEWPaC 2012b). More or less direct approaches and departures from the coast are also likely (DSEWPaC 2012b). SRW are thought to be solitary during migration or accompanied by a dependent calf (DSEWPaC 2012b). The Bass Strait and open waters surrounding Tasmania have been identified as migration BIAs for the species (NCVA 2023) (Figure 4-53) (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467).

A resident SRW female-calf pair is defined as a pair that has selected a breeding aggregation habitat to reside for the season (>1 week) to nurse and rear their young. These areas are considered biologically important for the species and mean residency periods are 65 days (Charlton 2017). Resident pairs occupy typically shallow water <10 m deep within 1 km of the coast (Charlton 2017). It is likely that some animals (including cows with small calves) may migrate south from these wintering areas through Western Bass Strait, including the proposed operational areas (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 42).

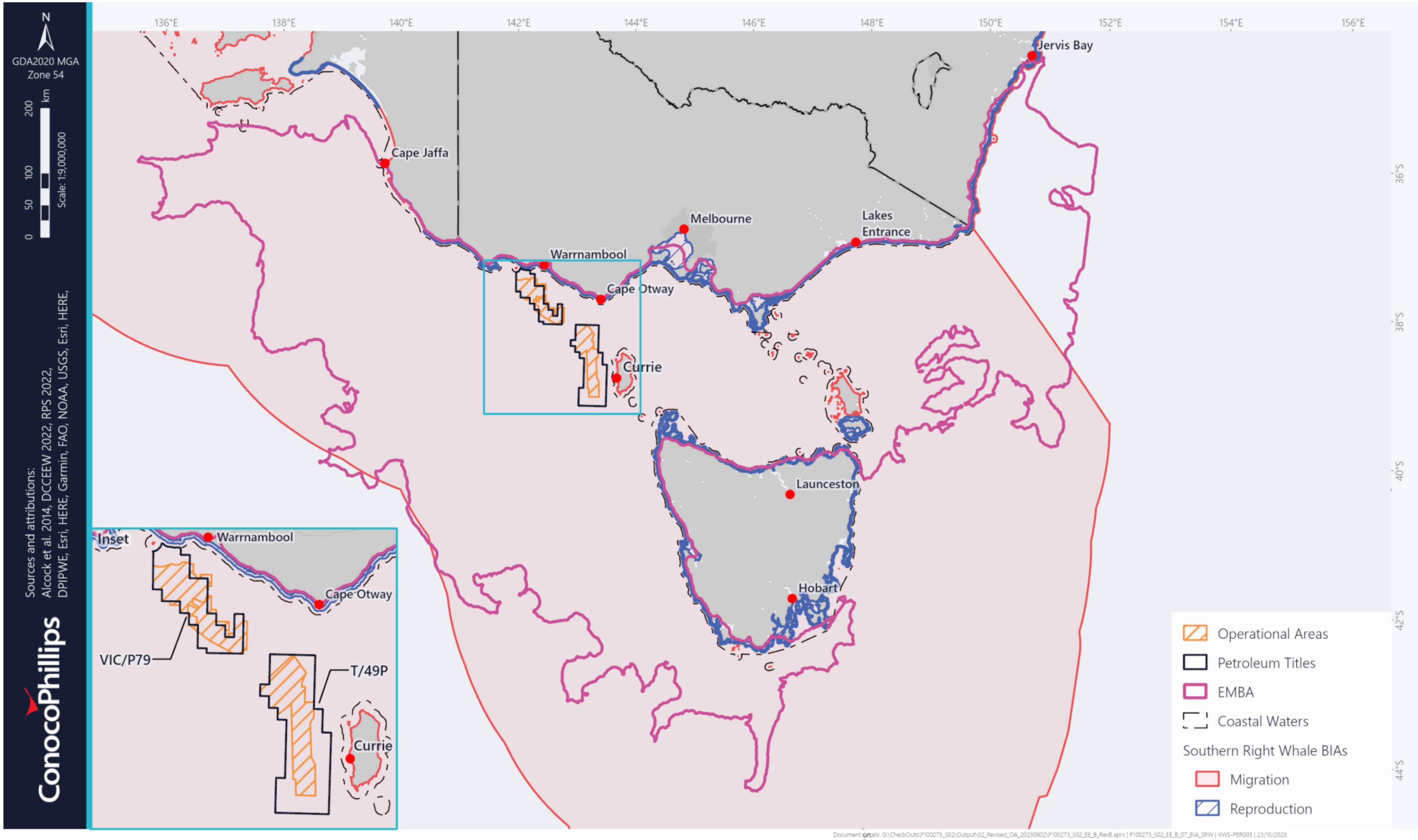


Figure 4-53: Southern right whale Biologically Important Areas within the EMBA

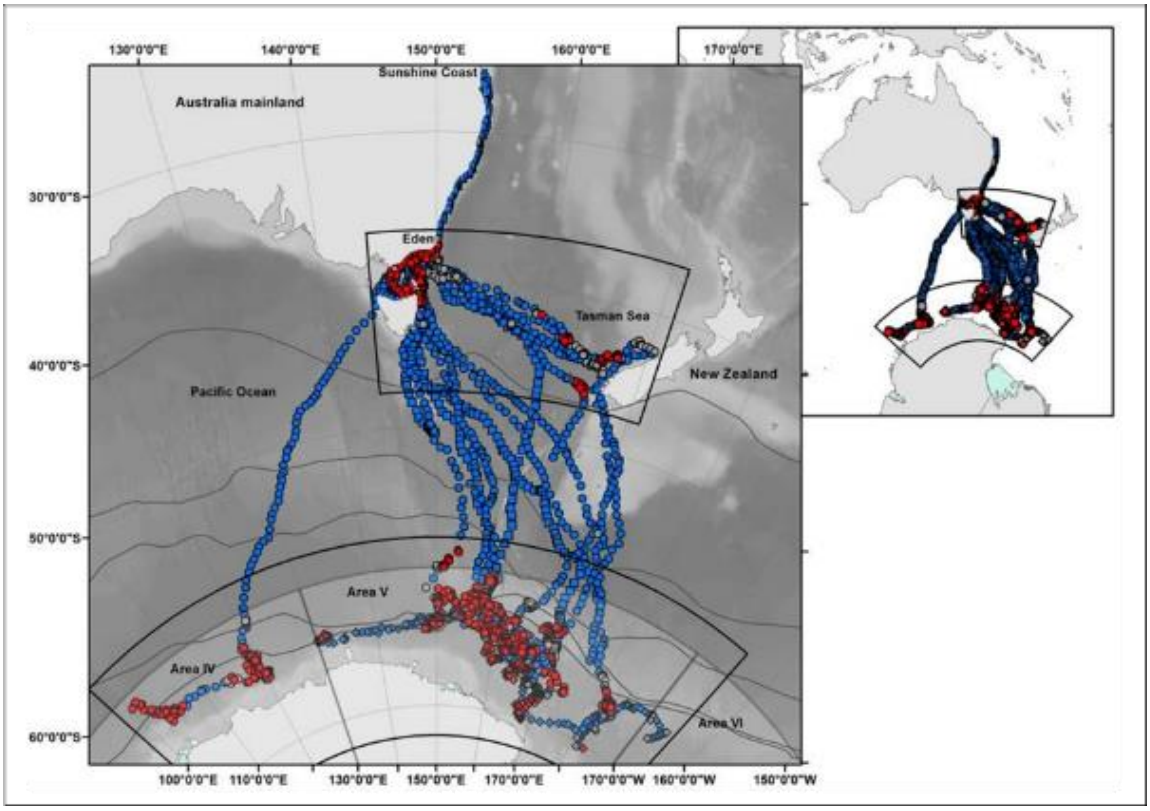
The **humpback whale** (*Megaptera novaeangliae*) (EPBC Act: listed Migratory; Listed as Endangered under Tasmanian legislation and Critically Endangered under Victorian legislation) is found throughout Australian Antarctic waters and Commonwealth offshore waters. There are two subpopulations that occur within Australian waters: the west coast population and the east coast population (Schmitt et al 2014).

Both the east coast and west coast Australian populations make their annual migrations between their winter breeding areas in tropical waters along the east and west coast of Australia (15° S to 20° S) and their summer feeding areas in the Antarctic (south of 56° S) (Chittleborough 1965; Dawbin 1966). The species reaches south-east Australian waters in April to May on the northerly migration from Antarctica and then again on their southern migration pathway during November to December each year (TSSC 2015b). The exact timing of the migration can vary depending on water temperature, sea ice and predation risk (DoE 2022). A report by Andrews-Goff et al (2018) details a study on humpback whale migrations to Antarctic summer foraging grounds through the south-west Pacific Ocean. In the austral summer of 2008/09, 2009/10 and 2010/11, the migrations of humpback whales were tracked using satellite tagging technology (Andrews-Goff et al. 2018). Twenty-one of the whales migrated south along the coastline and across Bass Strait during the month of October. Throughout November, 12 whales migrated south via the east coast of Tasmania, while one whale migrated via the west coast of Tasmania and continued in a south westerly direction into the Pacific Ocean and then moved onto the Antarctic feeding grounds (Andrews-Goff et al. 2018). Seven whales travelled eastwards into the Tasman Sea crossing the 160°E meridian whilst still in temperate waters. This study highlights the unlikeliness of the western coast of Tasmania and western Bass Strait to be frequently utilised for humpback whale migration. A visual representation of the tracking study by Andrews-Goff et al (2018) and the divergent pathways of humpback whale migration routes are presented in Figure 4-54.

Over the past 60 years the status of humpback whales has dramatically improved due to the decline of commercial whaling and has subsequently resulted in their removal from the EPBC Act threatened species list as of February 2022. However, they are still afforded Commonwealth protection as a matter of national environmental significance due to their listing as a migratory species and cetacean (TSSC 2022). Current known impacts to the species include climate and oceanographic variability and change, entanglement with marine debris, sound interference and vessel disturbance and strike, however they are not expected to threaten the population growth of the species (TSSC 2022).

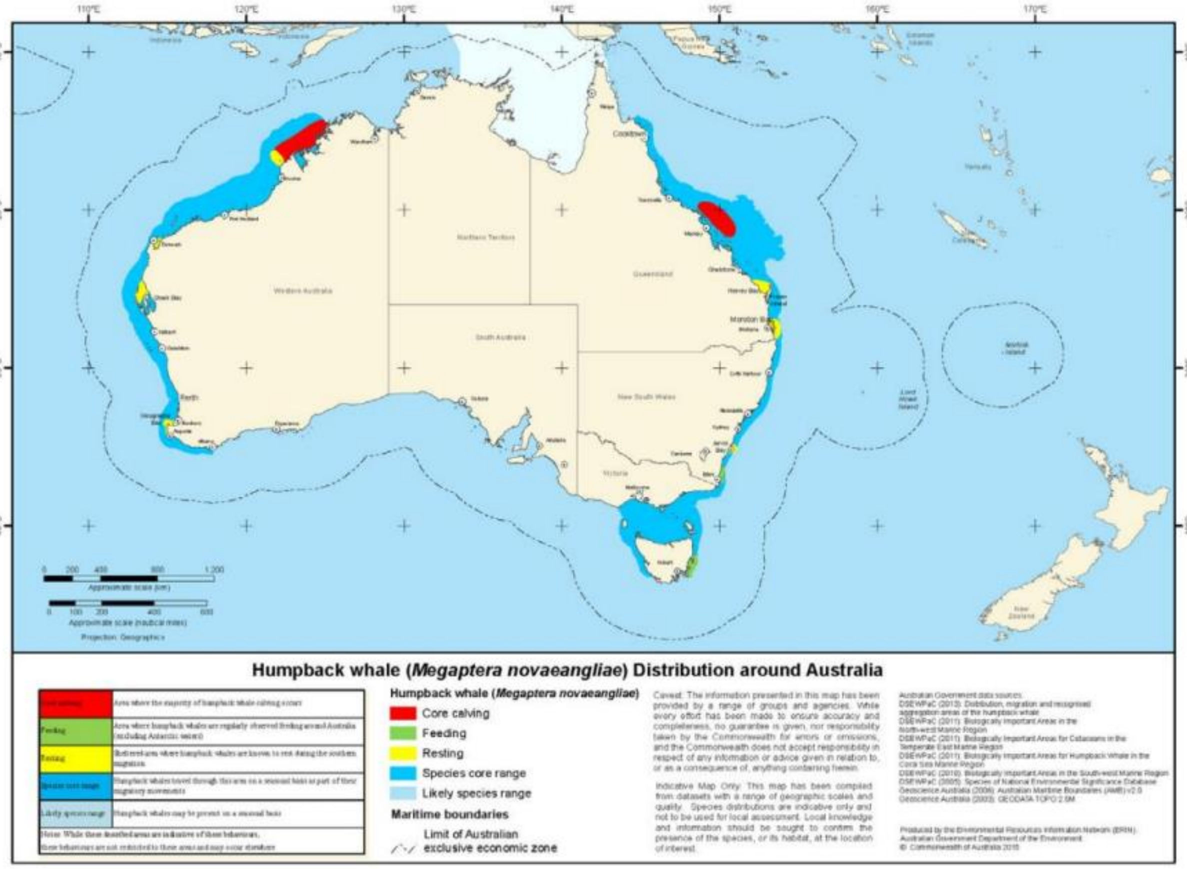
Although the species is no longer listed as Threatened under Commonwealth legislation certain states have continued to classify the species as threatened. In Tasmania, the humpback whale is listed as Endangered and protected under the *Threatened Species Protection Act 1995*. The state recommends following the Conservation Advice developed by the Threatened Species Scientific Committee (2015g). Threats to the species are similar to those described above, however conservation and management actions include a call for additional research into the impacts of anthropogenic noise and the implementation of management plans and strategies developed to reduce the risk of threats to this species. In Victoria, the southern humpback whale (*Megaptera novaeangliae australis*) is listed as Critically Endangered and protected under the *Flora and Fauna Guarantee Act 1988*. In 2009 the state developed an Action Statement for the species which identifies state specific threats such as entanglement, anthropogenic noise, ship strike, oil spill and marine debris. Main objectives outlined in this statement include the minimisation of human impact to humpback whales and a focus on understanding the distribution, abundance and migration patterns of the species in Victorian waters (DSE 2009).

Figure 4-55 below shows the distribution of humpback whales along the coast of the Australian mainland, including areas of known calving, feeding and resting habitat. Feeding, resting or calving is not known to occur in Bass Strait (TSSC 2015b) though migration through Bass Strait could occur. A foraging BIA for the humpback whale at Twofold Bay, Eden off the New South Wales south coast intercepts with the EMBA (Figure 4-56).



Source: Andrew-Goff et al. 2018

Figure 4-54: Migration pathways for 30 humpback whales satellite-tagged off the eastern coast of Australia



Source: DCCEEW 2023

Figure 4-55: Humpback whale distribution around Australia

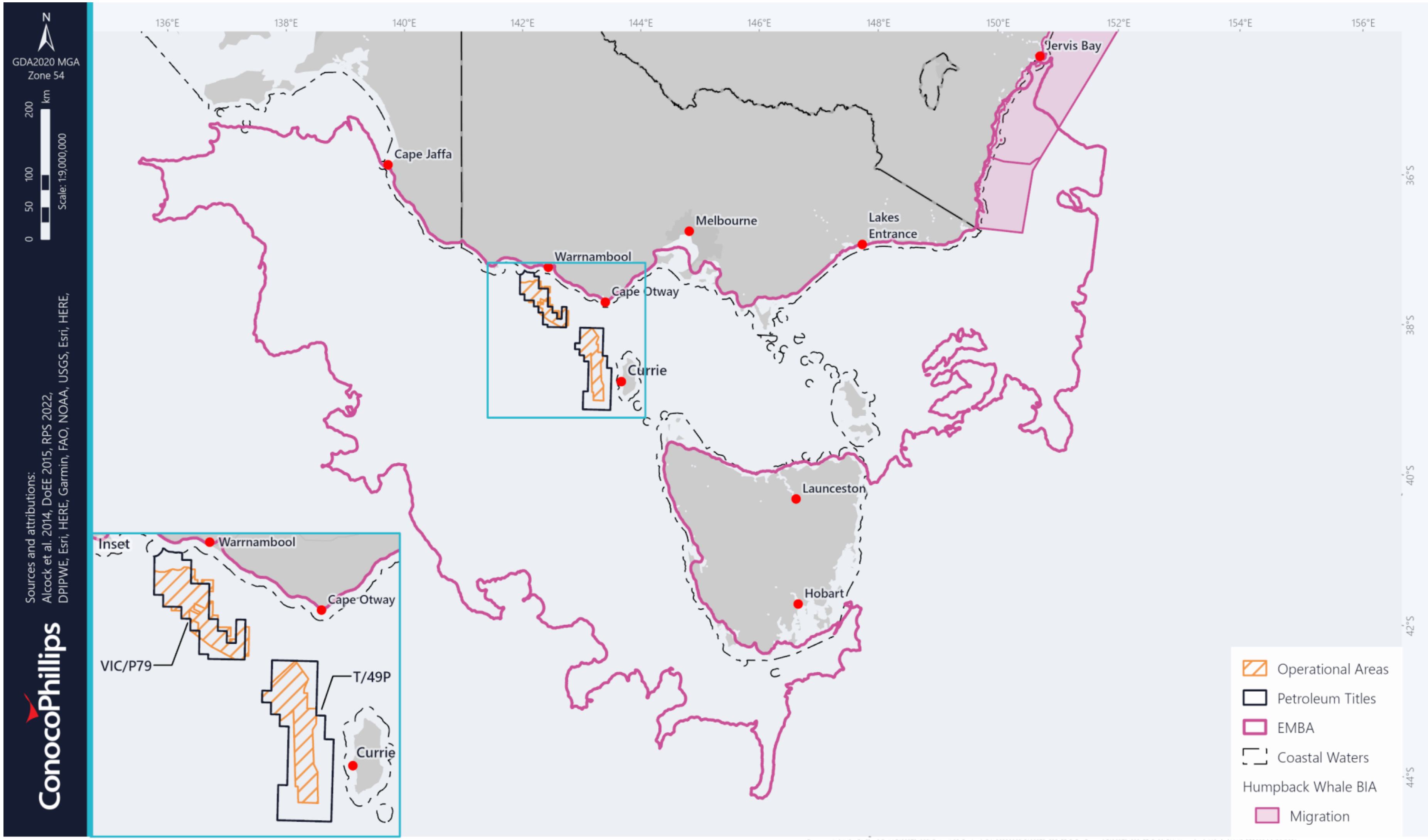


Figure 4-56: Humpback whale Biologically Important Areas within the EMBA

The **sperm whale** (*Physeter macrocephalus*) has been recorded in each Australian state; however they tend to be concentrated off the Western Australian coast at either the Perth Canyon or the Albany canyons group. The species prefers the deep waters of submarine canyons at the edge of the continental shelf typically at depths around 600 m (DoE 2022) (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 347). There appears to be a generalised movement of sperm whales southwards in summer and corresponding movement northwards in winter, particularly for males. Key threats to this species are collisions with vessels, entrapment in fishing gear, noise pollution and marine pollution including oil spills and the dumping of industrial wastes (DoE 2022). Sperm whales are seasonal breeders with a prolonged mating season running from late winter to early summer. Gestation occurs over a 14.5 – 16.5 month period and calves are typically born between November and March (DoE 2022). Currently there are no specific calving localities recognised in Australian waters. Sperm whales primarily feed on squid however they have been known to prey on other marine species such as octopuses, and medium to large-sized demersal fishes, including rays, sharks and teleosts. The species are deep and prolonged divers who forage regularly. This can occur throughout the water column, although they tend to prefer foraging near the seabed (DoE 2022). A foraging BIA for the sperm whale intercepts the EMBA but does not overlap operational areas (Figure 4-57).

The **sei whale** (*Balaenoptera borealis*) (EPBC Act: Vulnerable; listed Migratory) is often mistaken for the Bryde's whale which has caused confusion and uncertainty surrounding their distribution and frequency of occurrence in Australia. This species participates in north-south migrations, moving between polar, temperate and tropical waters, however they tend not to penetrate polar waters and prefer aggregating offshore unlike other species of large whales (DoE 2022). In an aerial survey conducted between 2002-2013 the sei whale was observed feeding 20–60 km offshore on the continental shelf in the Bonney Coast Upwelling between the summer and autumn months (November to May) (DoE 2022). Currently, there is no confirmed foraging BIAs that occur within Australia waters, however the sightings of individuals feeding in the Bonney Coast Upwelling may indicate that this area is used for opportunistic feeding. This species feeds on planktonic crustacea and exhibit a unique feeding behaviour where they swim horizontally near the surface, skimming pelagic crustaceans (DoE 2022). Key threats to the sei whale include climate and oceanographic change, pollution, acoustic disturbance and vessel strike (TSSC 2015c). Breeding occurs in tropical and subtropical waters with reproduction beginning after nine years of age with a calving interval of 2.5 years (DoE 2022). There are no known breeding or calving grounds within Australian waters.

The **fin whale** (*Balaenoptera physalus*) (EPBC Act: Vulnerable; listed Migratory) participates in north-south migrations, moving between polar, temperate and tropical waters. They have been observed by aerial surveys conducted between 2002-2013 in South Australia waters during the summer and autumn months (November to May) which is consistent with the upwelling season (DoE 2022). Currently, there are no confirmed foraging BIAs that occur within Australia waters however there have been sightings of individuals feeding in the Bonney Coast Upwelling which may indicate that this area is used for opportunistic feeding. In addition to the sheer size of the fin whale, its tendency to lunge or skim feed at the surface make them particularly susceptible to vessel strikes which is listed as a threat in the Conservation Advice for *Balaenoptera physalus* fin whale (TSSC 2015d). Reproduction begins around 10 years of age with a calving interval of 2-3 years. There are no known breeding or calving grounds within Australian waters (DoE 2022).

The **dwarf minke whale** (*Balaenoptera acutorostrata subsp*) (EPBC Act: listed Migratory) is an unnamed subspecies of the minke whale which occurs in the near-shore tropical and warm temperate waters of the southern hemisphere. In Australia the southern extent of the subspecies is approximately 41° S which runs through the Bass Strait between Tasmania and mainland Australia and a northern extent of 11° S which runs across the top of mainland Australia (DoE 2023). It is unlikely that the dwarf minke whale migrates to the Antarctic waters, however there is potential for an increase in range with warmer water extending southwards. Satellite tagging of the subspecies shows that they are likely to migrate along the east coast of Australia from an aggregation area in the Great Barrier Reef south as far as the Bass Strait (Birtles et al. 2015 cited in IUCN-MMPATF 2022). However, insufficient evidence is available as to how Australian dwarf minke whales use their habitat as no specific feeding or breeding grounds have been discovered off Australia (DoE

2023). Key threats to the dwarf minke whale include noise and habitat disturbance due to the species preference for coastal environments as well as vessel strike, entanglement and pollution (DoE 2023).

The **Indian Ocean bottlenose dolphin** (*Tursiops aduncus*) is distributed throughout tropical and sub-tropical coastal and shallow waters and can be found anywhere offshore Australia; however, they prefer eastern, western and northern states (DoE 2022). Although dolphins are typically very social this species will feed individually on a variety of fish and cephalopods. Key threats to this species are accidental mortality and injury arising from interactions with commercial and recreational fishing activities, as well as the cumulative impacts of overfishing (DoE 2002). The Indian Ocean bottlenose dolphin reaches sexual maturity between 9 to 11 years and has a gestation period of one year however the period between pregnancies is typically 3 to 6 years. Mating and caving periods coincide with one another and peak in spring and summer or spring and autumn (DoE 2022). A breeding BIA for the Indian Ocean bottlenose dolphin intercepts with the EMBA (Figure 4-58).

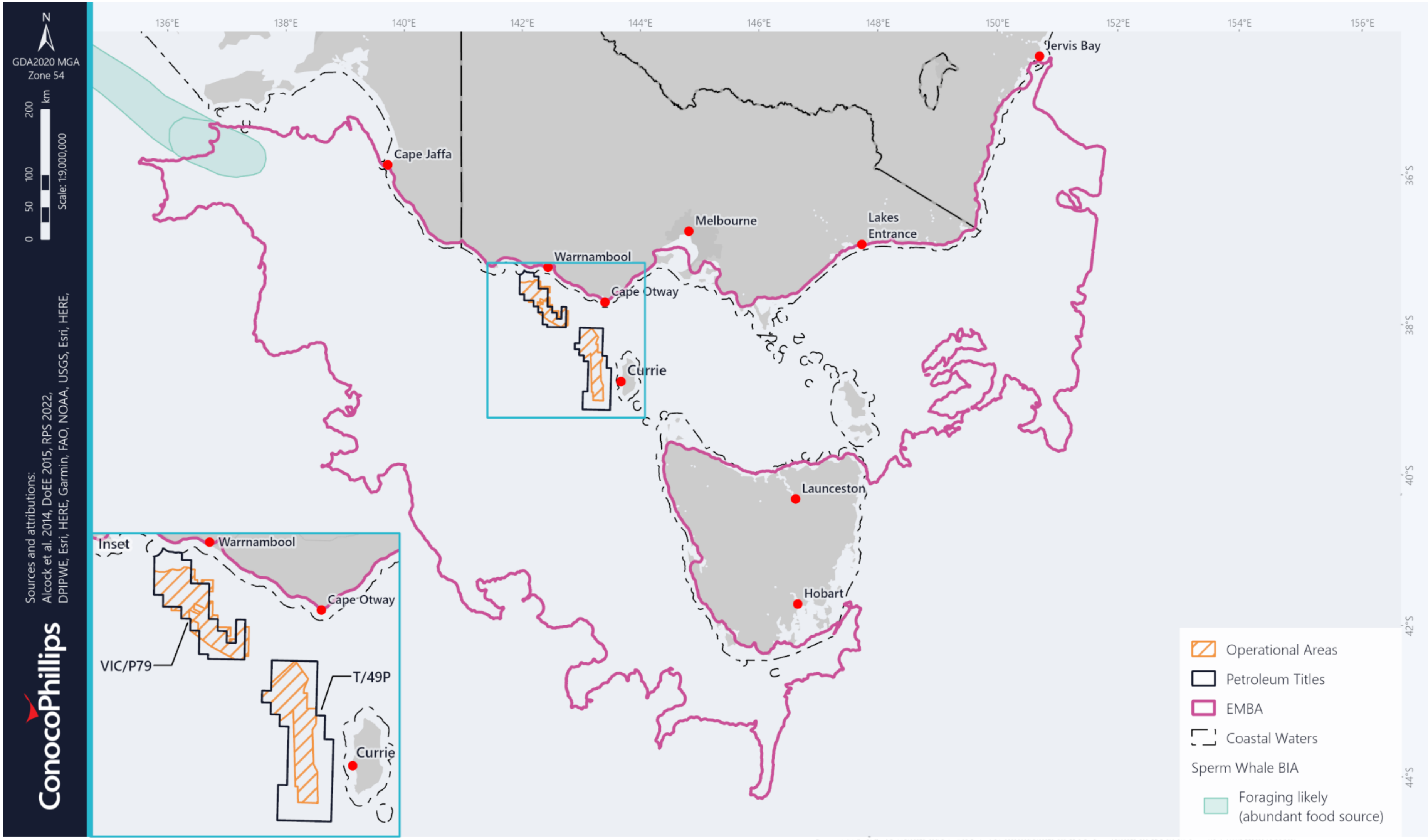


Figure 4-57: Sperm whale Biologically Important Areas within the EMBA

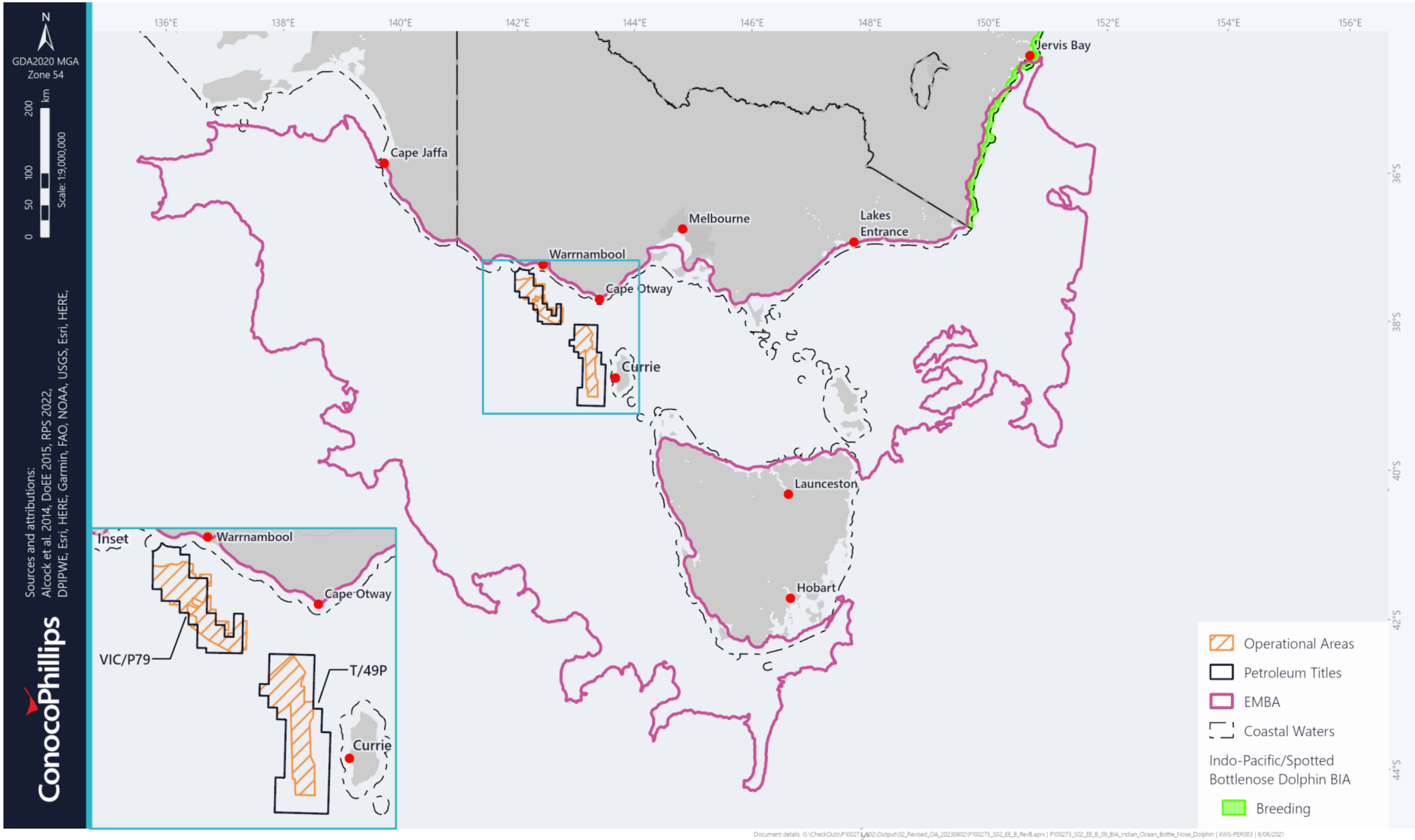


Figure 4-58: Indian Ocean bottle nose dolphin Biologically Important Areas within the EMBA

4.6.10. Terrestrial Mammals

Terrestrial mammals are warm blooded, have hair on their bodies, produce milk to nurse their young and live on land for all or part of their life. There are many terrestrial mammal taxonomic groups found in Australia which include monotremes (platypus, short-beaked echidna), marsupials (kangaroos, koala), and placentals (bats, rodents, foxes). Some mammal species are listed as threatened and/or migratory under the EPBC Act 1999, and these are considered a Matter of National Environmental Significance. Species may also be protected under state (and territory) environmental legislation. Due to this groups inability to survive in a marine environment the majority of species will not be impacted by offshore activities and therefore are not assessed. However, some impacts have the potential to overlap the terrestrial environment. If these impacts are listed as pressures for a particular species, they will be assessed within the EP.

The EPBC Act PMST report lists one species that has been categorised as a “terrestrial mammal” which has the potential to be impacted by the activity and the potential to occur within the within the EMBA (Table 4-15; Appendix B). This species has a EPBC threatened status of Critically Endangered and is the southern bent-winged bat (*Miniopterus orianae bassanii*). No BIAs were identified for any terrestrial mammals within the relevant EMBAs.

Southern bent-winged bat (*Miniopterus orianae bassanii*) (EPBC Act: Critically Endangered) is a cave-dwelling bat that is distributed from south-eastern South Australia to south-western Victoria. This species predominantly roosts in limestone caves, but can also be found in lava tunnels, coastal cliff rock crevices and man-made tunnels. The southern bent-wing bat is known to forage in a range of habitat type which include wetlands, native forested areas, native remnant vegetation and over cleared agricultural and grazing land (TSSC 2021). There are two notable maternity sites with long histories of occupation within the EMBA both of which are considered as habitat critical to the species survival. One is located in a sea cliff cave near Warrnambool in Victoria and the other site is located near Portland, Victoria which was discovered in 2015 (TSSC 2021). Mating occurs between December and March with the highest occupancy in maternity caves occurring between August and November (TSSC 2021). The National Recovery Plan for the southern bent-wing bat identifies human disturbance, disease and climate change as key threats to the species survival (DCCEEW 2020b). Due to the species lifestyle characteristics and habitat preference, they are unlikely to be affected by offshore activities, however they are considered due to their presence along the south-western Victorian coast.

Table 4-15: Terrestrial mammal species that may occur within the relevant EMBAs, and protection status

Scientific Name	Common Name	Listed Threatened	Listed Migratory	Listed Marine	Operational Area	Light (20 km)	Flaring (50 km)	MDO (MOD)	MDO (low)	LOWC (mod)	EMBA	EPBC Management Plan
Miniopterus orianae bassanii	Southern bent-winged bat	CE	-	-	-	BKO[VN]	RKO[T] BKO[VS] BKO[VN]	RKO[T] RKO[VS] BKO[VN]	BKO	BKO	BKO	Conservation Advice *Miniopterus orianae bassanii* Southern Bent-wing Bat

Threatened Status: CE – Critically Endangered	Type of presence: KO – Species or species habitat is known to occur within area BKO – Breeding known to occur within the area RKO – Roosting known to occur within the area	Operational Area: VN – VIC/P79 Northern extent	✓ Listed Migratory/Marine species Source: PMST; Appendix B [Table updated in response to Matter: I06].

4.6.11. Terrestrial Invertebrates

During consultation it was identified that the bogong moth could overfly the operational areas and light EMBAs (Org ID: 553, Australian Parents For Climate Action (North Tas and Surf Coast), Event ID: 3257, FB ID: 342; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 435). The bogong moth feed inland in an area ranging from southern Queensland to South Australia. During spring, they fly south to south-eastwards, to high altitude regions in the southern part of the Dividing Range, where they remain inactive (aestivation) throughout the summer months. Warrant et al. 2016 considered that there are many potential sensory cues along the migratory route that moths might rely on during their journey, including visual, olfactory, mechanical and magnetic cues. They are sometimes blown towards the coast by westerly winds and may be blown over to Tasmania due to the north-westerly prefrontal winds (Warrant et al 2016). However, there is no evidence of a permanent larval population in Tasmania—instead, populations arising each year in Tasmania are the result of repeat spring migrations from the Australian mainland (Hill 2007), most likely due to accidental displacements across Bass Straight by prefrontal northwesterly winds (Drake et al. 1981; Drake and Farrow, 1985). Consequently, impacts to the bogong moth associated with routine operational lighting and short-term flaring are not predicted and have not been assessed in the Environment Plan.

4.6.12. Invasive Marine species

An introduced species becomes an invasive pest when they become established in the marine environment. This often results in the displacement of native species, the domination of habitat or in uncharacteristic algal blooms. It is widely recognised that invasive marine species can cause significant impacts on economic, ecological, social and cultural values of the marine environment. Impacts can include the introduction of new diseases, altering ecosystem processes and reducing biodiversity, causing major economic loss and disrupting human activities (Brusati and Grosholz 2007). In the South-east Marine Region, 115 marine pest species have been introduced and an additional 84 have been identified as possible introductions, or ‘cryptogenic’ species (NOO 2002).

Invasive marine species known to occur were identified from ‘www.marinepests.gov.au’ (DAWE 2019), which details ports around Australia with established invasive marine species. The MODU and support vessels will mobilise to the Otway region from a Victorian port or another location within Commonwealth waters. Marine pests known to occur and ports most likely to be used (DAWE 2019) are detailed in Table 4.

Table 4-: Marine pests known to occur in ports relevant to the Otway Exploration Drilling Program

Marine Pest	Description	Port Hedland	Dampier	Fremantle	Adelaide	Melbourne	Portland	Hobart
Asian date mussel (*Musculista senhousia*)	Prefers soft sediments in waters up to 20 m deep, forming mats and altering food availability for marine fauna.	-	-	KO	KO	KO	KO	-
European fan worms (*Sabella spallanzannii*)	Attaches to hard surfaces, artificial structures and soft sediments, preferring sheltered waters up to 30 m deep. It reached Port Phillip Bay in the mid-1980s and is a nuisance fouler (Parks Victoria, 2020).	-	-	KO	KO	KO	KO	-
European shore crab (*Carcinus maenas*)	Prefers intertidal areas, bays, estuaries, mudflats and subtidal seagrass beds, but occurs in waters up to 60 m deep. It is widespread across Victorian intertidal reef and common in Western Port.	-	-	-	KO	KO	-	KO
Japanese kelp (Undaria pinnatifida)	Occupies cold temperate oceanic waters up to 20 m deep, growing on rock, reef, stones and artificial structures. It rapidly forms dense forests and overgrows native species. It first established in Port Phillip Bay in the 1980s (Parks Victoria, 2020).	-	-	-	-	KO	-	KO

New Zealand screw shell (*Maoricolpus roseus*)	Lies on or partially buried in sand, mud or gravel in waters up to 130 m deep. It can densely blanket the sea floor with live and dead shells and compete with native scallops and other shellfish for food. This species is known to be present in the Port Phillip and the Western Port region.	-	-	-	-	-	-	KO
Northern pacific seastar (*Asterias amurensis*)	Prefer soft sediment habitat, but also use artificial structures and rocky reefs, living in water depths usually less than 25 m (but up to 200 m water depths). It is thought to have been introduced through ballast water from Japan.	-	-	-	-	KO	-	KO
Aquarium Caulerpa (*Caulerpa taxifolia*)	Can overgrow native species and degrade fish habitats. Found in estuaries, coastal lagoons and bays. Native to northern Australia, from Port Denison, Western Australia to Southport, Queensland. Can be a pest in some southern locations. Established in some parts of New South Wales and South Australia.	-	-	-	KO	-	-	-
Asian shore crab (Hemigrapsus sanguineus)	Established in Victoria. Asian shore crabs were detected in Port Phillip Bay in 2020. Generally found hard substrates in intertidal areas, under rocks, shells, debris or artificial structures.	-	-	-	-	KO	-	-

Source: www.marinepests.gov.au (DAWE 2019) accessed on 24/10/22
KO = known to occur

Species that are not known to occur but are identified to watch for at relevant ports (DAWE 2019), include:

- Asian green mussel (*Perna viridis*)
- American slipper limpet (*Crepidula fornicate*)
- Asian basket clam (Corbula (Potamocorbula) amurensis)
- Black striped false mussel (*Mytilopsis sallei*)
- Chinese mitten crab (*Eriocheir sinensis*)
- Asian paddle crab (*Charybdis japonica*)
- Rapa or veined whelk (*Rapana venosa*)
- Soft shell or long-necked clam (*Mya arenaria and Mya japonica*), and
- Charru mussel (*Mytella strigata*).

4.7. Socio-economic Environment

4.7.1. Coastal Settlements

Australians have a strong affinity to the ocean, with over 80% of the population living within 50 km of the coast. Large coastal settlements and those close to Otway Exploration Drilling Program within the EMBA are based on ABS data and described below (ABS 2021).

The closest coastal settlements to the T/49P operational area occur on King Island, located approximately 90 km to the north-west of Tasmania, and approximately 80 km from the Victorian coastline. Approximately half of the population (of 1,617 people) live in the township of Currie located on the west coast (28 km from the operational area), with the remainder in smaller townships and along the coastline from Wickham in the north to Grassy and Naracoopa in the east. Land use on King Island is predominantly rural, with the main employment sectors being food processing, farming, fishing and hospitality. The island is renowned for excellence in the production of food products with beef and dairy farms covering the island and employing approximately 24.4% of the workforce (ABS 2021). The island has a small fishing industry, mostly focused on SRL and giant crab, which employs approximately 2.5% of the workforce (ABS 2021). In its submission to ConocoPhillips during the public exhibition of the Sequoia MSS EP in 2021, the King Island Council states that there are 18 SRL fishing vessels based at the island, all of which are locally owned and operated. King Island Dairy and JBS Australia are the two major employers on the island. Redevelopment of the historic tungsten mine on King Island is currently underway, with production scheduled to commence in 2023. During consultation, the King Island Council reinforced the importance of the King Island brand and the assessment of impacts to the brand (Org ID: 72, King Island Shire Council, Event ID: 4014, FB ID: 439).

The closest coastal settlement region to the VIC/P79 operational area is the shire of **Moyne,** which supports a population of 17,374 people with a median age of 45. Port Fairy, which represents the urban centre nearest to VIC/P79 (19 km from the operational area), supports a population of 3,424 with a median age of 52 (ABS 2021). Of those in the labour force in Moyne, 55% work full-time and 33.9% work part-time (ABS 2021). The agricultural industry (dairy, beef and sheep farming) makes up a significant portion of the workforce at 17.2% while hospitals make up 4.4%. Professionals, technicians, trade workers and managers make up 54.1% of occupations (ABS 2021). The Shire is characterised by agriculture, fresh seafood, manufacturing and tourism. The dairy industry is the dominant form of agriculture; however, sheep production and cereal crops are growing in size (Moyne Shire Council 2023).

The settlement regions of **Greater Geelong** and the **Mornington Peninsula** in Victoria have the largest populations within the EMBA. Greater Geelong has a population of 271,057 with a median age of 39. Of those in the labour force, 53.1% work full-time and 35.7% work part-time (ABS 2021). The agriculture, forestry and fishing industries employ less than 1% of the workforce while hospitals, primary education, supermarkets and grocery stores employ 11% of the workforce. Professionals, technicians, trade workers and managers make up 48.8% of occupations (ABS 2021). The region contains Victoria's largest provincial city and is characterised by wetlands, parklands and wildlife sanctuaries as well as being the gateway to the renowned coastline of south-west Victoria via the Great Ocean Road. The Mornington Peninsula has a population of 168,948 with a median age of 48. Of those in the labour force, 51.7% work full-time and 36.9% work part-time (ABS 2021). The agriculture, forestry and fishing industries employ less than 1% of the workforce while hospitals, primary education, supermarkets and grocery stores employ 9.6% of the workforce. Professionals, technicians, trade workers, and managers make up 52.9% of occupations (ABS 2021). The region contains areas of national and international conservation significance and features approximately 10% of Victoria's total coastline.

A significant coastal region for tourism in Victoria is **Colac-Otway** with a population of 22,423. The urban centre of Apollo Bay supports a population of 1,491 with a median age of 51 (ABS 2021). Of those in the labour force in Colac-Otway, 53.0% work full-time and 35.9% work part-time, with professionals, managers, technicians and trade workers making up 49% of occupations (ABS 2021). The region includes a large section of the Great Otway National Park as well as part of the National Heritage listed Great Ocean Road which temporarily increases the population of Apollo Bay to around 20,000 each summer (Colac Otway Shire 2022).

Additional coastal settlement regions that fall within the EMBA are listed below along with information on population size (ABS 2021) and approximate distance to the closest operational area:

- Moyne (VIC) – population of 17,374, 17 km from closest point of VIC/P79 operational area.
- Warrnambool (VIC) – population of 35,406, 20 km from closest point of VIC/P79 operational area.
- Corangamite (VIC) – population of 16,115, 31 km from closest point of VIC/P79 operational area.
- Glenelg (VIC) – population of 20,152, 37 km from closest point of VIC/P79 operational area.
- Colac-Otway (VIC) - population of 22,423, 43 km from closest point of VIC/P79 operational area.
- Surf Coast (VIC) – population of 37,694, 89 km from closest point of T/49P operational area.
- Circular Head (TAS) – population of 8,117, 104 km from closest point of T/49P operational area.
- Grant (SA) – population of 8,636, 108 km from closest point of VIC/P79 operational area.
- Queenscliffe (VIC) – population of 3,276, 153 km from closest point of T/49P operational area.
- Bass Coast (VIC) – population of 40,789, 172 km from closest point of T/49P operational area.
- Wattle Range (SA) – population of 11,888, 175 km from closest point of VIC/P79 operational area.
- Waratah-Wynyard (TAS) – population of 14,300, 186 km from closest point of T/49P operational area.
- West Coast (TAS) – population of 4,263, 200 km from closest point of T/49P operational area.
- South Gippsland (VIC) – population of 30,577, 220 km from closest point of T/49P operational area.
- Robe (SA) – population of 1,542, 230 km from closest point of VIC/P79 operational area.
- Kingston (SA) – population of 2,326, 263 km from closest point of VIC/P79 operational area.

- Wellington (VIC) – population of 45,639, 272 km from closest point of T/49P operational area.
- Dorset (TAS) – population of 6,829, 322 km from closest point of T/49P operational area.
- Flinders (TAS) – population of 922, 357 km from closest point of T/49P operational area.
- Huon Valley (TAS) – population of 18,259, 389 km from closest point of T/49P operational area.
- East Gippsland (VIC) – population of 48,715, 401 km from closest point of T/49P operational area.
- Kingborough (TAS) – population of 40,082, 433 km from closest point of T/49P operational area.
- Tasman (TAS) – population of 2,593, 459 km from closest point of T/49P operational area.
- Bega Valley (NSW) – population of 35,942, 607 km from closest point of T/49P operational area.
- Eurobodalla (NSW) – population of 40,593, 672 km from closest point of T/49P operational area.
- Shoalhaven (NSW) – population of 108,531, 733 km from closest point of T/49P operational area.
- Unicorp. Other Territories (ACT) – population of 2,494, 784 km from closest point of VIC/P79 operational area.

4.7.2. Offshore Exploration, Production and Development

4.7.2.1. Offshore Petroleum Activities

ConocoPhillips Australia, as the titleholder of petroleum titles T/49P and VIC/P79, can confirm that no additional petroleum exploration or drilling activities are planned within the operational areas during the Otway exploration program. Abandoned oil and gas infrastructure, namely plugged and abandoned wells drilled by Esso Exploration and Production Australia over 40 years ago, are known to occur within the T/49P operational area and within the southern extent of the VIC/P79 operational area as described in Table 4-16.

Table 4-16: Petroleum infrastructure within the operational areas

Permit Area	Purpose	Well	Spud Date	Status	Latitude/Longitude (D.D)
T/49P	Exploration	Prawn A1B	29/12/1967	Abandoned	-39.355026 143.113008
	Exploration	Prawn A1C	19/01/1968	Abandoned	-39.355026 143.113008
	Exploration	Prawn A1	29/12/1967	Abandoned	-39.355026 143.113008
VIC/P79 Southern Extent	Exploration	Mussel 1	18/08/1969	Abandoned	-38.961299 142.774057
	Exploration	Nautilus A 1	13/04/1968	Abandoned	-38.976573 142.547413
	Exploration	Triton 1	24/01/1982	Abandoned	-38.981845 142.531635

Source: NEATS 2023; NOPIMS 2023

Petroleum exploration has been undertaken within the Otway Basin since the early 1960s. Significant gas reserves have been discovered in this area, with production currently occurring from multiple gas fields. The Otway Basin petroleum reservoirs are described in Table 4-17 and shown in Figure 4-59.

Table 4-17: Petroleum reservoirs in production within the Otway Basin

Fields	Operator	Description	Approximate distance from closest operational area
Minerva	Woodside	Commenced production in 2005. Development consists of two subsea wells in water depths of 60 m.	24.5 km from VIC/P79 South
Casino, Netherby, Henry (CHN)	Cooper Energy	Development consists of 4 subsea wells in water depths of 65 -71 m.	13 km from VIC/P79 South
Halladale and Black Watch	Beach Energy	Wells were drilled from an onshore location in 2016 and are approximately 5.5. km offshore.	19 km from VIC/P79 North
Thylacine and Geographe	Beach Energy	Commenced production in 2007. Development consists of 11 subsea wells, three of which are suspended, and four of which will come online in 2023. In water depths of 85 - 100 m.	7.28 km from VIC/P79 South

A review of the NOPSEMA website (NOPSEMA 2023) identified a number of Environment Plans that are either under assessment or have been approved within the EMBA as listed in Table 4-18 and shown in Figure 4-59.

Table 4-18: Environmental Plans within the EMBA

Proponent	Project	Activity Type	EP Status	Approximate distance from closest operational area
Esso Australia Resources Pty Ltd	JUR Drilling	• Drilling • Construction and installation of a facility	Accepted 2019	372 km from T/49P
Beach Energy (Operations) Limited	Yolla Infill Drilling	• Drilling	Under Assessment	200 km from T/49P
Cooper Energy Limited	BMG Closure Project Phase 1	• Drilling • Any other petroleum-related activity • Decommissioning, dismantling or removing a facility	Accepted 2022	470 km from T/49P
	BMG Closure Project Phase 2	• Decommissioning	Under Assessment	470 km from T/49P
Woodside Energy (Victoria) Pty Ltd (Formally BHP Petroleum (Victoria) Pty Ltd)	Minerva Plug and Abandonment and Field Maintenance	• Drilling • Any other petroleum-related activity	Accepted 2019	24.5 km from VIC/P79 Southern Extent
	Minerva Plug and Abandonment and Field Maintenance	• Drilling	Under Assessment	24.5 km from VIC/P79 Southern Extent
Cooper Energy Limited	Otway Offshore Operations – CHN	• Operation of petroleum pipeline	Accepted 2017	13 km from VIC/P79 Southern Extent
		• Operation of petroleum pipeline	Under Assessment	
Beach Energy (Operations) Limited	Thylacine Installation and Commissioning	• Significant modification of a facility	Under Assessment	7.28 km from VIC/P79 Southern Extent
Carnarvon Hibiscus Pty Ltd	West Seahorse Development	• Other survey	Accepted 2015	367 km from T/49P
	West Seahorse-3/Wardie-1 Non Production Operations	• Other petroleum related activity	Accepted 2019	367 km from T/49P
	West Seahorse-3/Wardie-1 Non Production Operations	• Other petroleum related activity	Under Assessment	367 km from T/49P
Cooper Energy Limited	Gippsland Offshore Operations	• Operation of petroleum pipeline • Any other petroleum-related activity	Accepted 2019	426 km from T/49P
Esso Australia Resources Pty Ltd	Gippsland Basin Geophysical and Geotechnical Investigations	• Other survey	Accepted 2020	368 km from T/49P
SGH Energy Pty Ltd	Longtom Operations	• Operation of a petroleum pipeline • Construction and installation of a facility	Accepted 2020	440 km from T/49P

Proponent	Project	Activity Type	EP Status	Approximate distance from closest operational area
Beach Energy (Operations) Limited	Otway Development Drilling and Well Abandonment	• Drilling	Accepted 2022	2.3 km from VIC/P79 Southern Extent
Esso Australia Resources Pty Ltd	Bass Strait Operations	• Operation of a facility • Operation of a petroleum pipeline • Recovery of petroleum using a subsea installation	Accepted 2021	342 km from T/49P
Beach Energy (Operations) Limited	Otway Phase 5 Early Dive Installation Campaign	• Any other petroleum-related activity	Accepted 2022	2.5 km from VIC/P79 Southern Extent
Beach Energy (Operations) Limited	Otway Offshore Operations	• Operation of a petroleum pipeline • Any other petroleum-related activity • Other survey • Drilling • Construction and installation of a pipeline	Accepted 2022	7.28 km from VIC/P79 Southern Extent
Tasmanian Gas Pipeline Pty Ltd	Tasmanian Gas Pipeline Offshore	• Operation of a petroleum pipeline	Accepted 2019	290 km from T/49P

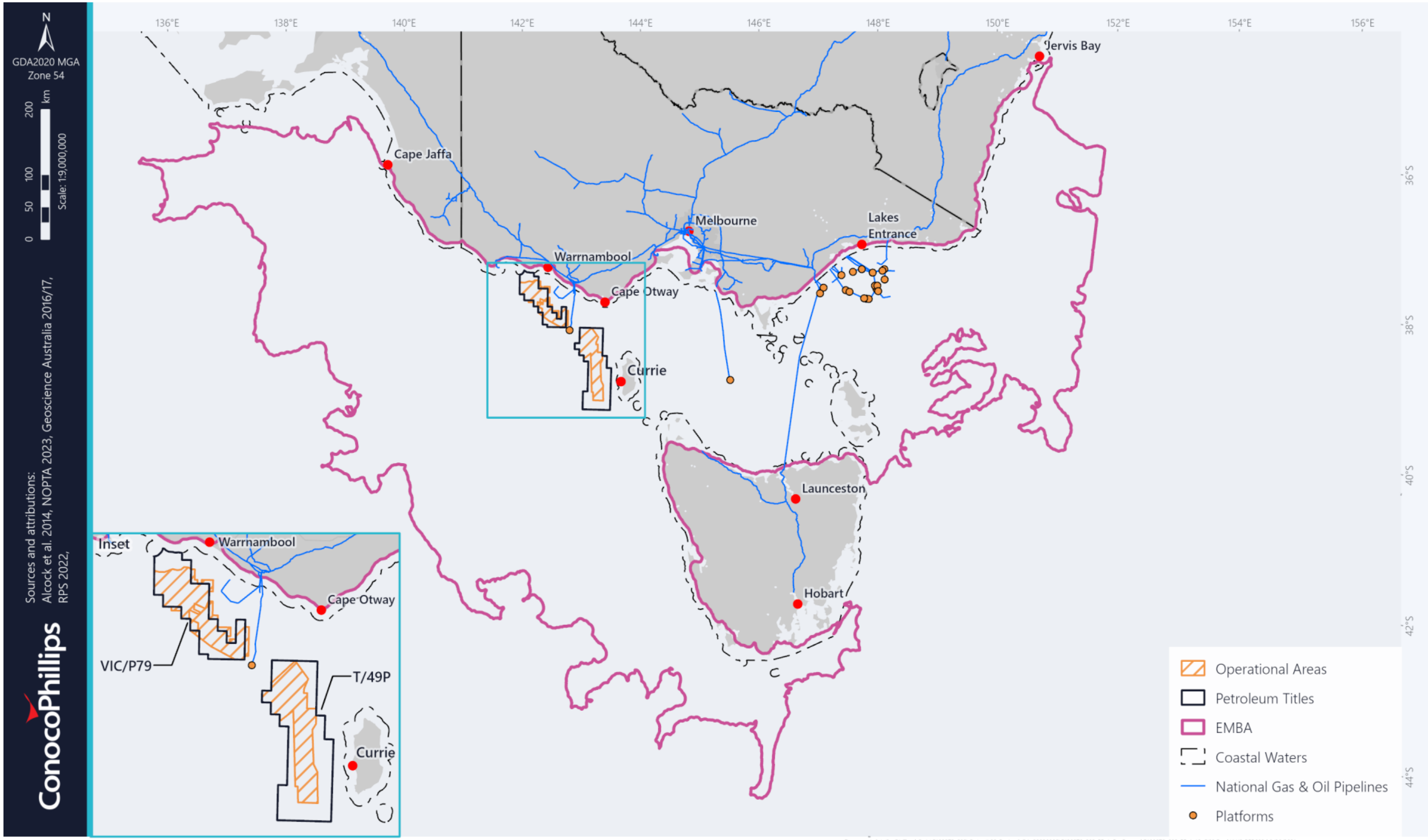


Figure 4-59: Offshore Petroleum Infrastructure within the Bass Strait

4.7.2.2. Offshore Renewable Energy Activities

In 2021 Australia introduced the Offshore Electricity Infrastructure Bill 2021 (Cth) (OEI Act) and in August 2022 the Federal Government announced 6 proposed areas in Australian Commonwealth waters for offshore renewable energy projects. Proposed areas relevant to the Otway Exploration Drilling Program are mentioned below.

- Bass Strait region off the coast of Gippsland in Victoria
- Southern Ocean region off the coast of Portland in Victoria
- Bass Strait region off the coast of Northern Tasmania
- Pacific Ocean region off the coast of Hunter in NSW, and
- Pacific Ocean region off the coast of Illawarra in NSW.

Projects located within the Bass Strait region off the coast of Gippsland are likely to provide Australia's first offshore renewable energy as this is the first area under consideration. Currently, the majority of proposed projects are offshore wind farms and, while there are a number of proposals for windfarms off the coast of Victoria and Tasmania, no project has progressed further than pre-feasibility, technical or grid studies. Consequently, there are no confirmed offshore renewable energy projects overlapped by the operational area, however there are 2 proposed offshore wind farm projects in the feasibility stages of development overlapped by the operational area of VIC/P79.

The Southern Ocean Region (Figure 4-60) extending from Warrnambool, Victoria to Port MacDonnell, South Australia, is being considered for offshore wind and other renewable energy projects. However, this initial area is a proposal for feedback only and has not been "declared to be suitable" by the Australian Government.

The EMBA overlaps 18 proposed offshore renewable energy developments which are listed below along with the approximate distance to the closest point of the nearest operational area (Figure 4-60).

- Spinifex (1,000 MW) is intersected by the VIC/P79 operational area.
- Barwon Offshore Wind farm (1,000 MW) is intersected by the VIC/P79 operational area.
- Cape winds Offshore Wind Farm (2,000 MW), 34 km from closest point of operational area.
- Southern Winds Offshore Wind Farm (1,200 MW), 80 km from closest point of VIC/P79 operational area.
- Bass Coast South (1,000 MW), 150 km from closest point of T/49P operational area.
- Bass Coast North (1,000 MW), 169 km from closest point of T/49P operational area.
- Great Southern (1,500 MW), 178 km from closest point of T/49P operational area.
- SA Offshore Wind Farm (600 MW), 272 km from closest point of VIC/P79 operational area.
- Star of the South (2,200 MW), 291 km from closest point of T/49P operational area.
- Great Eastern Offshore Wind Farm (2,500 MW), 297 km from closest point of T/49P operational area.
- Kingston Offshore Wind Farm (400-600 MW), 310 km from closest point of VIC/P79 operational area.
- Azure Offshore Wind Farm (1,000 km), 324 km from closest point of T/49P operational area.
- Bass Offshore Wind Energy (500 MW), 329 km from closest point of T/49P operational area.
- Blue Marlin (2,000 MW), 335 km from closest point of T/49P operational area.
- Greater Gippsland (1,400 MW), 336 km from closest point of T/49P operational area.
- Seadragon (1,500 MW), 352 km from closest point of T/49P operational area.
- Eden Offshore Wind Farm (2,000 MW), 627 km from closest point of T/49P operational area.
- Ulladulla Offshore Wind Farm (1,800 MW), 765 km from closest point of T/49P operational area.

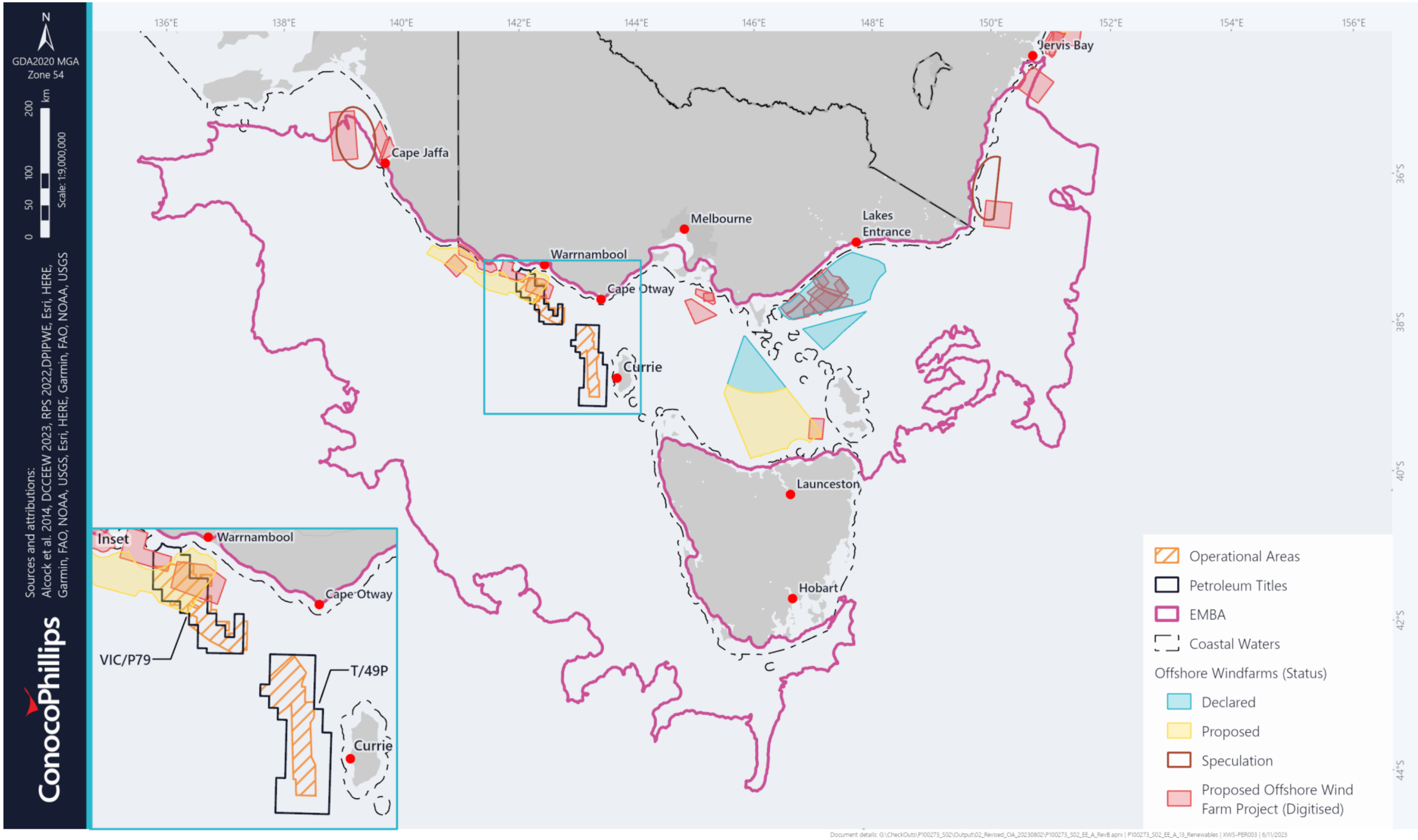


Figure 4-60: Offshore renewable energy proposed developments within the EMBA

4.7.2.3. Other Offshore Infrastructure

The Victorian Desalination Plant, located at Wonthaggi, is approximately 200 km north-east of the T/49P operational area. Operation of the plant commenced in December 2012. The seawater intake and outlet structures are connected to the onshore plant via a 1.2 km and 1.5 km underground tunnel, respectively. The two intake structures are 8 m high, 13 m in diameter, situated 50 m apart and located in a water depth of 20 m, and operate at very low speeds (Figure 4-61).

Aquaculture facilities typically operate nearshore sub-surface seawater intakes at locations along the Victorian coastline (Org ID: 113, Moyne Shire Council, Event ID: 2442); producing abalone at Allestree and Port Fairy, mussels at Queenscliff and Flinders, and seaweed in Port Phillip Bay; and on King Island (SRL hatchery and oyster farm). Some aquaculture facilities also collect brood stock from the marine environment (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 271).

The Indigo-central subsea telecommunications cable connecting Perth to Sydney runs in an easterly-westerly direction to the north of King Island and overlaps with the T/49P operational area (Figure 4-61).

Further, there are two Telstra telecommunications cables to the east of King Island (Figure 4-61).

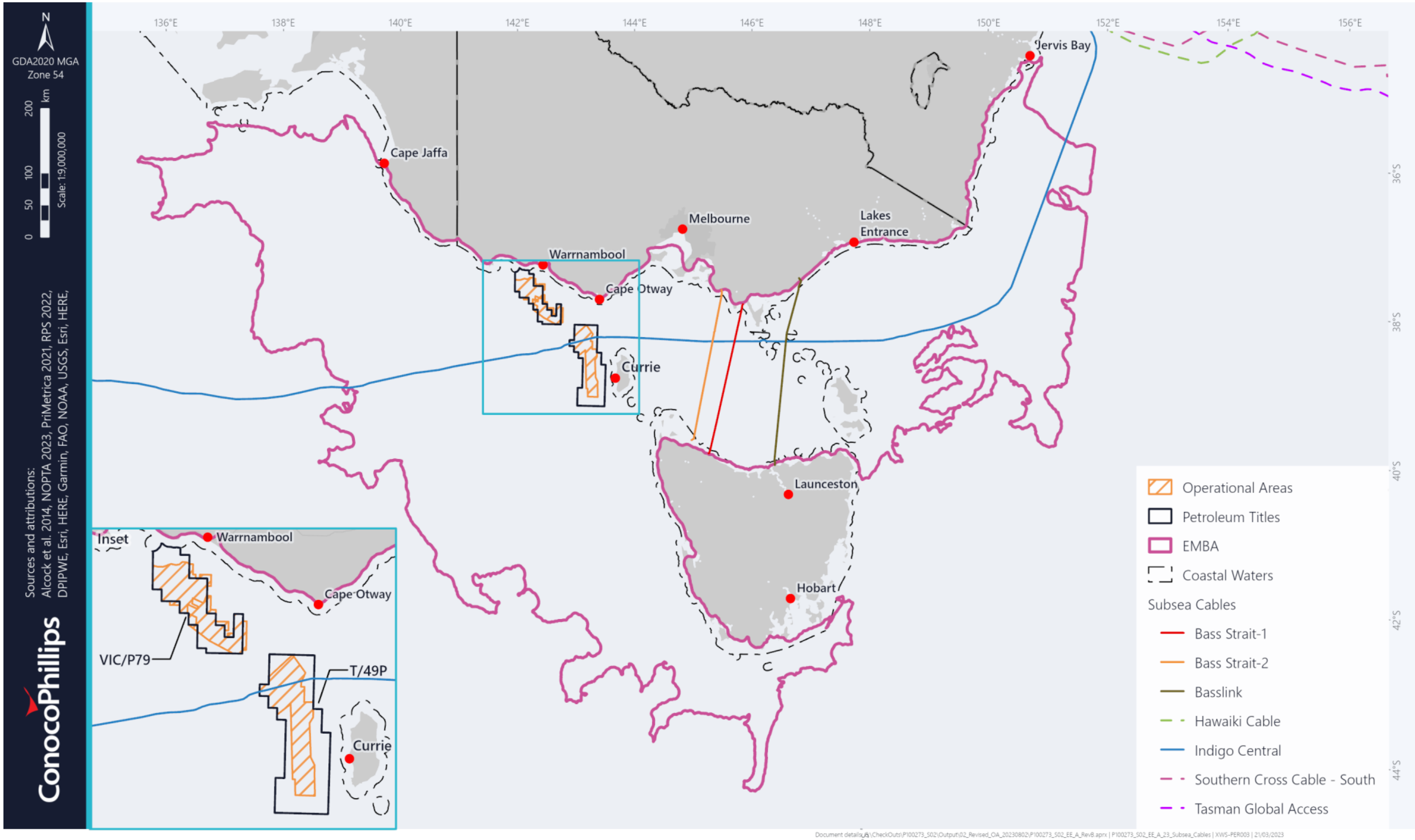


Figure 4-61: Other Offshore Infrastructure within the EMBAs and operational area

4.7.3. Defence Activities

The south-east marine region is important for a range of defence activities particularly training exercises. Australian Defence Force (ADF) activities in the region include transit of naval vessels, training exercises, shipbuilding and repair, hydrographic survey, surveillance, enforcement, and search and rescue (DoE 2015b). No defence practice, training or protected areas were identified within the operational areas. However, there are two significant offshore training areas that overlap the EMBA (Figure 4-62; Figure 4-63).

The West Head Gunnery Range located on the Mornington Peninsula is a gunnery school for the Royal Australian Navy with a designated offshore practice and training area. The Eastern Australian Exercise Area is situated in Jervis Bay where the Royal Australian Navy (RAN) conducts a wide range of activities, including missile firings, weapons systems engagements, sub-surface activities, and anti-air warfare training. The Royal Australia Air Force (RAAF) also exercise in the area, using the ranges for missile firings.

The Department of Defence's (DoD) interactive Unexploded Ordnance (UXO) in Australia map (DoD 2021) was used to determine locations that are at risk of hosting UXO within the vicinity of the operational areas (UXO are a by-product of past training activities undertaken by the ADF). Locations outside of the operational areas were not assessed as LOWC impacts are not expected to affect UXO.

Following previous discussions with the Directorate of Contamination Assessment Remediation and Management Infrastructure Division, Estate & Infrastructure Group for the Sequoia MSS (DoD EIG 2021, approved meeting notes within Appendix K) it was confirmed to ConocoPhillips Australia that one area designated as having an UXO category of Slight Potential intersects the T/49P operational area (Figure 4-63):

- Area 1052 – former air-to-air firing range. Air-to-air training activities conducted within these bounds. Majority of ammunition would have been Ball (non-high explosive). The ADF previously stated that the risk to the Sequoia MSS (marine seismic survey) from this ammunition is negligible (UXO Category: Slight Potential) (DoD EIG 2021 in ConocoPhillips Australia 2021).
- Further, an additional military and UXO desktop study and risk assessment was conducted by RPS, which assessed the risk associated with each type of munition that may be present and each pathway to exposure (Appendix K; RPS 2022). This study identified:
    - A low risk of encountering UXOs within the operational areas for all activities, with the exception of Snag on Vessel.
    - The risk of a UXO being snagged on submarine equipment and subsequently brought onto a vessel was assessed as moderate based on the increased severity of consequence.

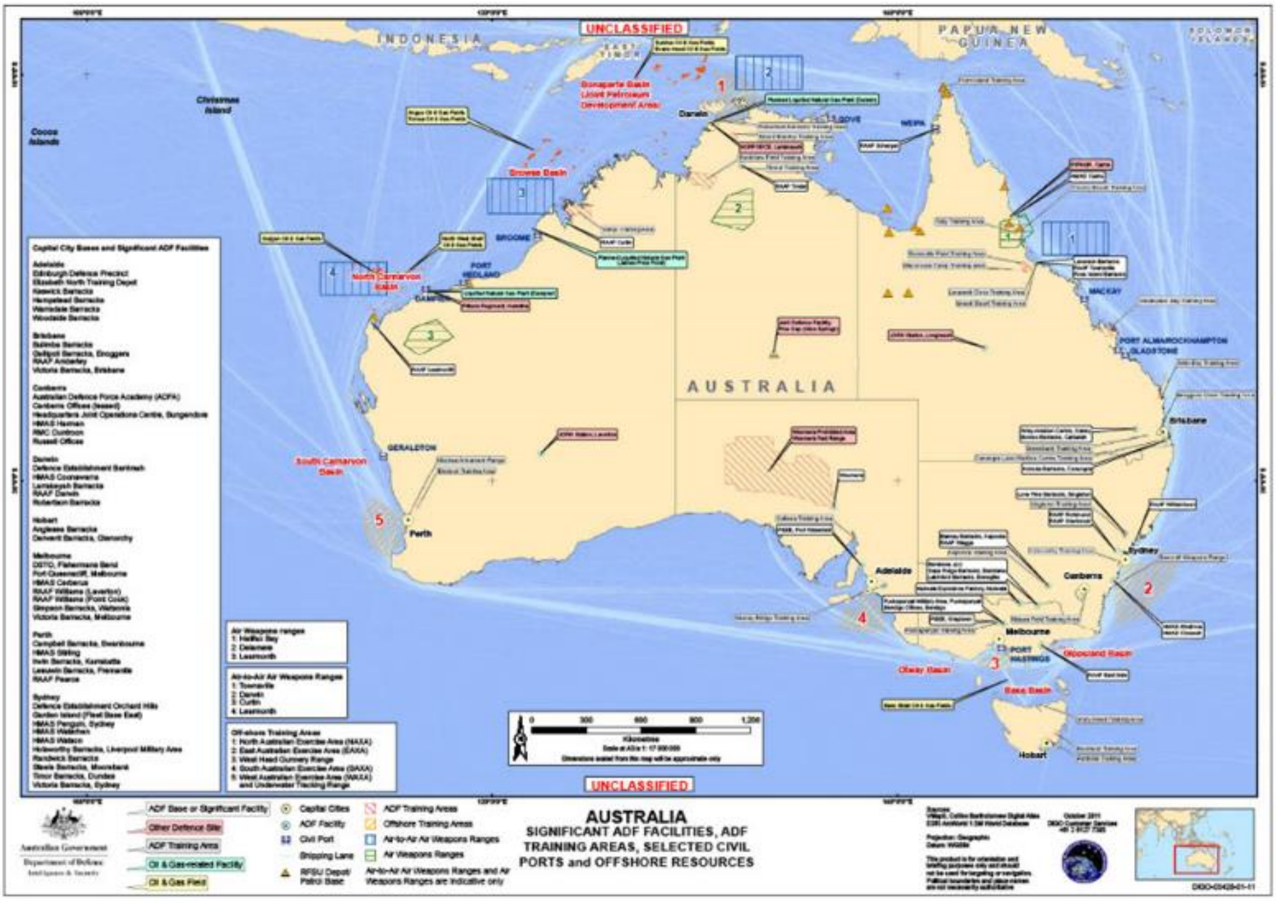


Figure 4-62: Significant ADF facilities and training areas

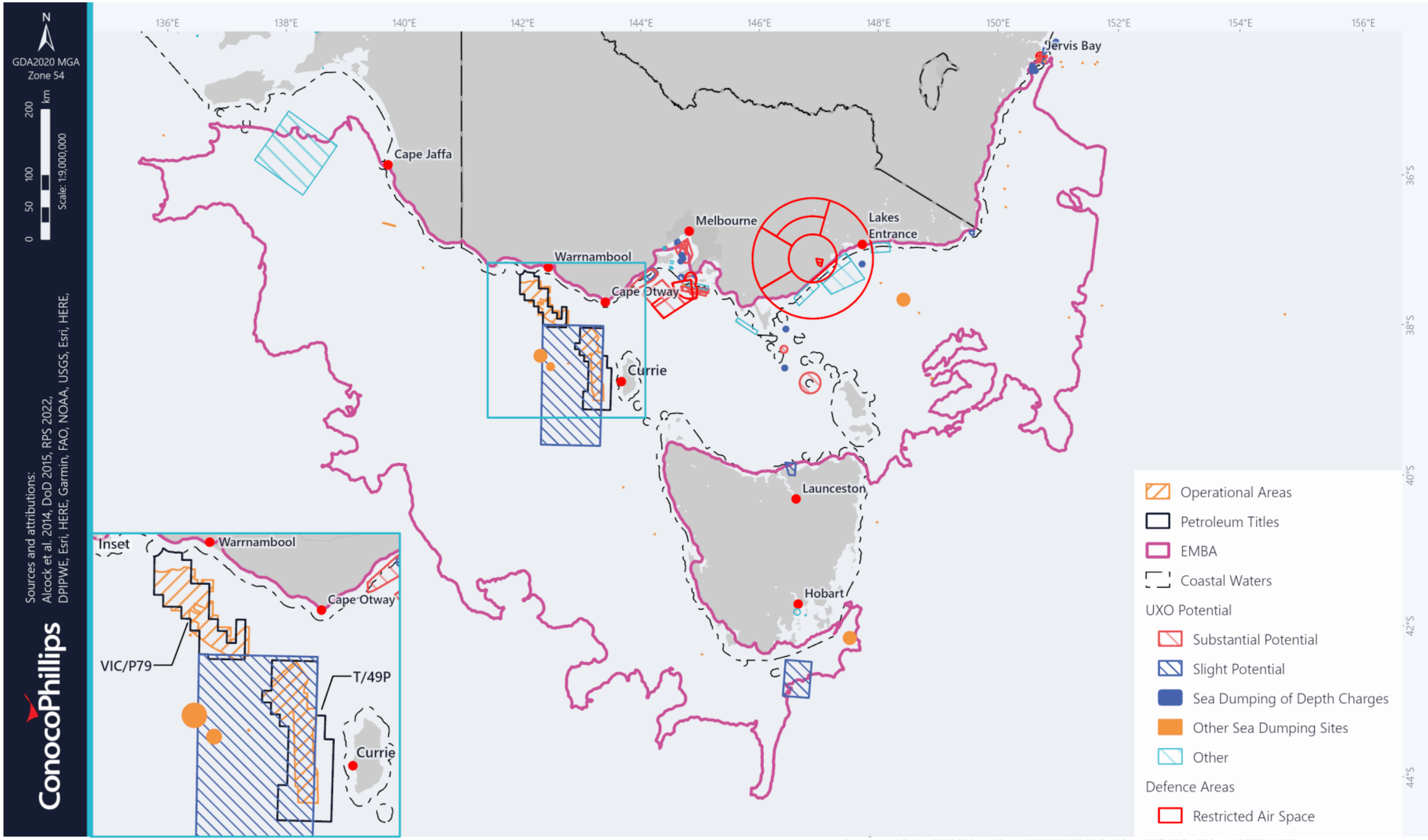


Figure 4-63: Defence activities intersected by the EMBA

4.7.4. Shipping

The South-east Marine Region (which includes Bass Strait) is one of the busiest shipping regions in Australia (DoE 2015b). Shipping consists of international and coastal cargo trade, passenger services and cargo and vehicular ferry services across Bass Strait (DoE 2015b). Commercial vessels use the route when transiting between ports on the east, south and west coasts of Australia, and there are regular passenger and cargo services between mainland Australia and Tasmania (NOO 2004). Further, Bass Strait is also transited by commercial vessels that may not call into ports on the south coast.

The EMBA overlaps the majority of the South-east Marine shipping region whilst the main shipping route runs through the VIC/P79 operational area (Figure 4-64). Advice provided by AMSA states that heavy vessel traffic will be encountered in both T/49P and VICP/79 (Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 4903).

Ports Australia (2021) provide statistics for port operations throughout Australia's main commercial ports. Based on the latest available information (2019 – 2020 financial year) the majority of commercial shipping traffic transiting to and from Victorian ports were containers (1,915), general cargo (1,423), bulk liquid (1,076), dry bulk (886), car carrier (656), bulk gas (111) and livestock (7).

The Australian Maritime Safety Authority (AMSA) provided a plot of Automated Identification System (AIS) data overlapping the operational areas for the period July -December 2022 during consultation (AMSA 2022). This information reinforced that heavy vessel traffic will be encountered over the operational areas, especially within VIC/P79. A summary of data from AMSA for 2022 is presented in Table 4-19 and indicates an average of 1.1, 4.8 and 4.3 vessels pass through the T/49P, VIC/P79 (northern extent) and VIC/P79 (southern extent) operational areas respectively.

Table 4-19: Summary of shipping traffic within and adjacent to the activity area (2022)

Vessel type	T/49P		VIC/P79 NORTHERN EXTENT		VIC/P79 SOUTHERN EXTENT	
	Number of vessels*	**Average speed (kts)**	**Number of vessels***	**Average speed (kts)**	**Number of vessels***	**Average speed (kts)**
Cargo ship	224	11.9	1299	13.1	1052	12.4
Tanker	115	11.5	194	11.8	328	11.5
Passenger	8	7.8	12	14.8	13	13.5
Other	9	12.7	44	11.5	44	7.4
Tug	7	8.7	15	9.5	12	6.9
Fishing	42	4.5	23	7.6	19	5.5
Sailing	4	5.6	33	6.1	5	7.6
Total	416	10.8	1769	12.5	1563	11.9
Average per day	1.1	-	4.8		4.3	-

*Calculated as total individual vessels per day

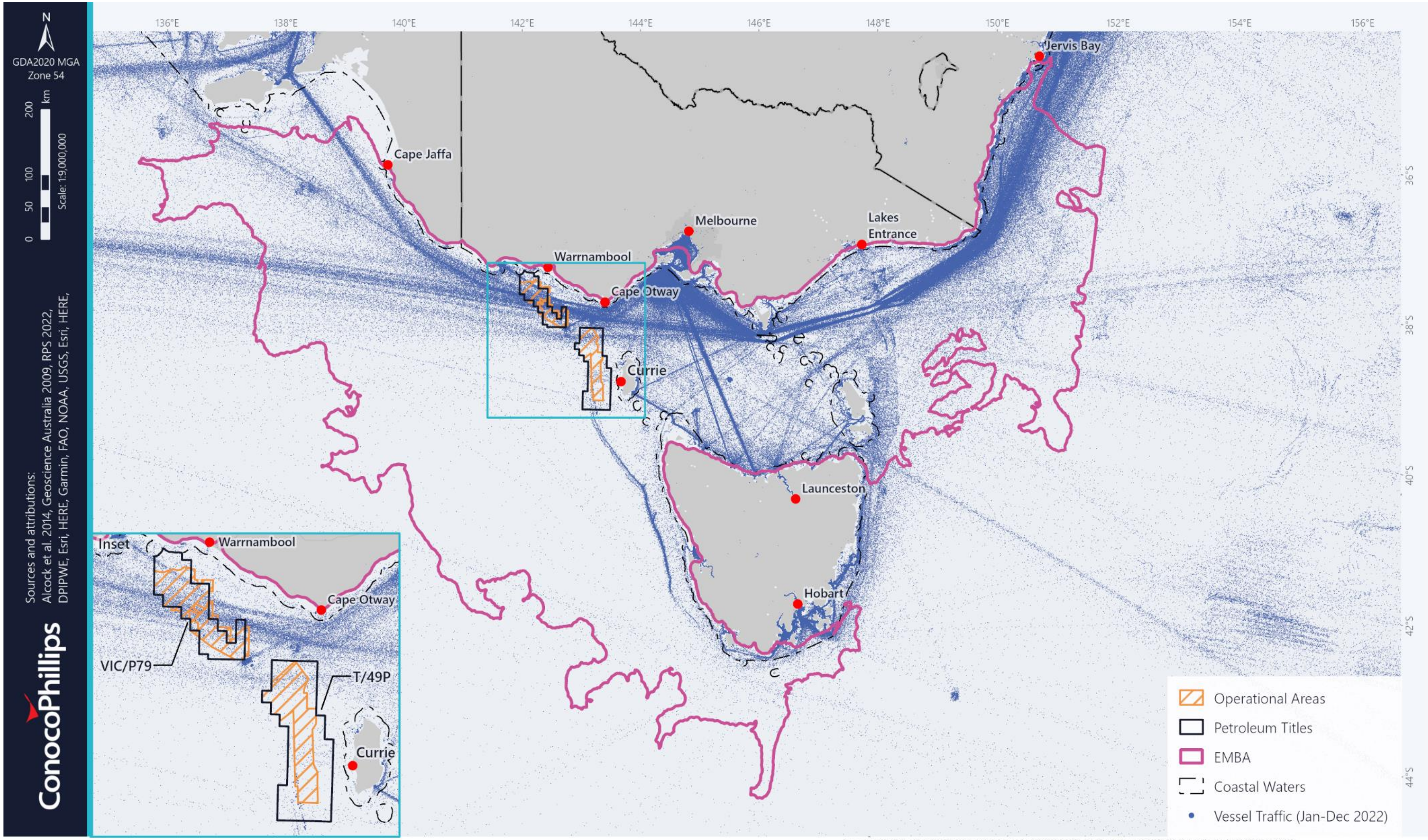


Figure 4-64: Commercial shipping activities within the EMBA

4.7.5. Tourism

Tourism includes activities related to retail, accommodation, cafes and restaurants, cultural and recreational services, events and festivals, and nature experiences and is unique to each region.

4.7.5.1. Tasmania

Nicol et al (2013), identified that 703 jobs were supported by King Island's economy, primarily in agriculture and fishing, which employed 164 people, followed by manufacturing employing 130 people. Tourism employed 34 people representing 4.9% of King Island employment (Nicol et al. 2013).

Tourism statistics available from the King Island Council (2016) show:

- Total visitors to the island during 2015/2016 was approximately 13,500 with 64% of this population staying 3 nights or less (short-break holiday)
- Purpose of visit: Business (33%), holiday (49%) and visiting relatives (16%)
- Origin of visitors: Victoria (39%), Tasmania (29%) and NSW (16%) with international visitors (3%)
- High season for tourism on the island is mid-October to mid-April
- Activities undertaken on the island during visits included recreational walks (29%), visiting arts and crafts shops (21%), food related festivals/tourism (16%), bird watching particularly penguins (9%), golf (8%), game bird hunting (6%), surfing (3%), and diving/snorkelling (2%)
- Places most visited were Lavinia Beach/Penny's Lagoon and the Calcified Forest/Seal Rocks Reserve.

The tourism sector is estimated to generate $5 million in annual economic output, contributing to a total output from the King Island economy of $190.6 million (Nicol et al. 2013). The King Island tourism sector is estimated to contribute just over 0.2% of the Tasmanian tourism output (Nicol et al. 2013).

King Island is renowned for its fresh produce, recreational activities including fishing, surfing, kiteboarding and golf (which has been bolstered by the 2021 King Island Golf Tourism Campaign), and natural environment. In addition, the Ocean Racing Club of Victoria (ORCV) holds an ocean yacht race to Grassy, King Island from Queenscliff, Victoria on the Labour Day weekend in March every year, and the summer Melbourne to Hobart 'Westcoaster' which traverses the west coast of King Island from late December to early January each year (ORCV 2023) (Org ID: 510, Ocean Racing Club Victoria (ORCV), Event ID: 2617, FB ID: 62).

During consultation it was identified that coastal tourist towns like Stanley and Boat Harbour regularly attract visitors to look for whales, in the usually quiet winter months, where they have experienced southern right whales close to shore for extended periods (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 347).

4.7.5.2. Victoria

Tourism statistics for regional Victoria show a total of 53.9 million domestic visitors including 18.3 million domestic overnight visitors and 35.6 million domestic daytrip visitors, however these levels are only 88% of the pre-pandemic numbers (Business Victoria 2023). The Great Ocean Road tourism region in particular places enormous importance on the coastal and marine environment as they are the key attractions drawing visitors in. This region extends from the South Australia/Victoria border east to Geelong. Between 2017-2020 statistics show visitor numbers (includes domestic daytrip and domestic and international overnight trips) peaked in 2019 with a total of 7,038,000 people visiting the region. Within the same 2018/2019 season tourism employed 13,100 people or 19% of workers in the region (Business Victoria 2023). Further, tourism was estimated to be worth approximately $1.1 billion in direct and indirect Gross Regional Product (Business Victoria 2021).

Whale watching during the northern migration of southern right whales attracts tourists to the Victorian coastline from typically May to early October. The coastline encompassing Portland and Warrnambool offer some of the best shore-based whale watching locations atop cliff tops, rocky outcrops, and purpose-built viewing platforms (Visit Victoria, 2018a). At the southern right whale aggregation area offshore from Logan's

Beach in Warrnambool, whales can be observed from within 100 m of the coastline from viewing platforms (Visit Victoria, 2023a). In Portland, popular viewing locations include off the coast from Cape Bridgewater to Narrawong, Port of Portland and the cliffs above Nuns Beach and Portland Bay (Visit Victoria, 2023a). Blue whales rarely approach land; however, the headlands of Cape Nelson and Cape Bridgewater provide opportunities for viewing blue whales at a distance (Visit Victoria, 2023a). Offshore whale watching and research is undertaken from helicopters and light planes, and occasionally vessels.

Whilst penguin tourism is not mentioned in the top 9 regional Victorian attractions (DJSIR 2019) it is noted that The Penguin Parade on Phillip Island receives over 700,000 visitors annually and over 1,800 individuals engaged in the Penguin Protectors talks at Middle Island, Warrnambool in the 2012-2022 season (Warrnambool Council 2022). All are acknowledged as being an important economic source to the regional economy. [Paragraph added in response to Matter: B04].

4.7.5.3. Recreational Diving and Surfing

Tasmania

King Island is known for several wreck sites and the Waterwitch Reef. According to the King Island Council (2016), 2% of all visitors to the island undertake diving or snorkelling activities. There are a number of operators around the region including Warrnambool Sub Aqua Club who offer dive charters in and around King Island. Popular spots to dive include the Three Kings on the northern tip of the island and near Currie towards Phoques Bay on the north west of the island.

Winds in summer generally prevail from the south-east which opens up most of the west coast of the island to surfing including beaches like British Admirals, Porky Beach and Phoques Bay, with prevailing west to south-west winds in winter, protected beaches like Martha Lavinia and Colliers Beach are favoured (King Island Surf Safaris 2023). Surfing tours operate on the island.

Victoria

The Otway coastline is home to the shipwreck trail which is a popular recreational diving attraction for the region. There are a number of operators around the region including Portland SCUBA which is Victoria's only PADI dive centre, however there are no specific dive charters available from Portland. Popular dive sites along the shipwreck coast include shipwrecks such as the wreck of Emily S, which lies in 24 m of water and Loch Ard in 25 m of water. Between Portland and Warrnambool there are several shore dives ideal for snorkelling off the shore, including Peasoup off the south coast of Port Fairy and Lee Breakwater on Nuns Beach in Portland.

There are numerous popular surfing areas along the Victorian coastline including Bells Beach, Johanna Beach, Robe, Beachport, Port MacDonnell, Cape Northumberland, Guichen and Rivoli Bays, Southend, Cullens, and Posties, Princetown, Gibson Steps, Port Campbell, and Peterborough, Lighthouse and Green Island, The Passage, the reefs of Gabbos and Gooloos, Logan's Beach, The Flume, Levy's Beach, East Beach, Shelley beach, the water tower near Portland, Yellow Rock, Crumpets, and Whites Beach (Surfing Atlas, 2023; Visit Victoria, 2023b). Although mid-December to mid-January (school holiday period) is the most popular time for surfing along the Great Ocean Road, autumn and winter (March – August) represent the best time of the year for surfing (Wildlife Tours 2023). There are also a number of learn-to-surf schools along the coast.

4.7.5.4. Recreational Fishing, including Charters and Nature Experiences

Tasmania

Tourist and recreational fishing charters such as Southern Coast Charters and King Island fishing operate from King Island all year round and from Port Fairy which is 20 minutes West of Warrnambool. Fishing charters include deep sea fishing, reef fishing, and tuna fishing in the offshore coastal waters.

The main fishing areas on King Island shown in Figure 4-65 are located at: Grassy Jetty, Bold Head, Naracoopa Jetty, Sea Elephant, Lavinia Point, Three Sisters, Phoques Bay, Currie and British Admiral Point.

Licences are not required for rod and line fishing in Tasmanian marine waters however certain species or methods do require the fisher to hold a licence. Within the area species or methods which require a licence for recreational fishing include:

- Abalone
- Rock lobster
- Scallop
- Set-line (longlines and droplines), and
- Graball net, mullet net and beach seine net fishing.

The most recent survey of recreational fishing in Tasmania found the pastime to hold its popularity with over 100,000 Tasmanians participating at least once a year (Lyle et al. 2019). Approximately $161 million is spent annually by recreational fishers on boats, fishing gear and bait with 75% of all fishing effort occurring in saltwater. Saltwater fishing primarily occurs in inshore coastal waters with offshore fishing (>5 km off the coast) contributing a minor component to the fishery (Lyle et al. 2019). A wide variety of species are caught by recreational fishers; however, flathead appears to be the most popular accounting for 70% of all finfish caught (Lyle et al. 2019). Other species to note include the Australian salmon, trout and a variety of shellfish such as squid, scallops, abalone and rock lobster. [Paragraph added in response to Matter: F14].

Victoria

A 2008/2009 study found that 721,000 Victorians participated in recreational fishing and contributed $825 million per year to the total Victorian Gross State Product, $188.4 million from the south west region (DEECA 2023). However, it was acknowledged that approximately 60% of all recreational fishing activity occurs inland, including estuarine water bodies.

In Victoria, a recreational fishing licence covers all forms of recreational fishing in all of Victoria's waters and is required when taking or attempting to take in public waters of any species by any method (VFA 2022b). Popular fishing areas along the south west Victorian coast include Fisherman's Beach in Torquay, Wild Dog Beach in Apollo Bay, Johanna Beach in the Otway, Gibson Steps in Port Campbell and Hopkins River in Warrnambool.

A number of fishing charters operate along the Victoria coastline, offering deep sea experiences from key port locations.

Source: DPIPWE (2019)

Figure 4-65: King Island coastal fishing location map

4.7.6. Commonwealth Managed Fisheries

Commonwealth fisheries are managed by the Australian Fisheries Management Authority (AFMA) under the Fisheries Management Act 1991 (Cth). AFMA jurisdiction covers the area of ocean from 3 nm from the coast out to the 200 nm limit (the Australian Fishing Zone (AFZ)). Commonwealth commercial fisheries with jurisdictions to fish within the EMBA are detailed in Table 4-20. Though certain fisheries possess jurisdiction to fish in this area, analysis of publicly available and requested catch data indicates that not all fisheries have recently (within the last 10 years) actively fished within the EMBA (Patterson et al. 2020). Table 4-20 also details whether the fishery is active.

Where there is evidence of recent fishing, a detailed description of the fishery is provided in the following sections. Catch and effort data for these fisheries has been obtained from Fisheries Status Reports published by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). Relative fishing intensity shows areas where 5 or more fishing vessels operated with the relative effort expended or the catch displayed. Reporting grids show the total area where fishing occurred at a resolution of one degree (approximately 111 x 111 km). Intensity data may not be displayed where less than or equal to 5 vessels operated (policy requirement to protect commercial confidentiality of data). ConocoPhillips Australia also commissioned SETFIA and Fishwell Consulting to provide an updated report on catch from fisheries (Appendix C).

Table 4-20: Commonwealth fisheries within the EMBAs

Commonwealth Fishery	Recorded Fishing in the EMBAs in the last 10 years
Bass Strait Central Zone Scallop Fishery (BSCZSF)	✓
Skipjack Tuna Fishery (STF): - Eastern Skipjack Tuna Fishery (ESTF) - Western Skipjack Tuna Fishery (WSTF)	X
Eastern Tuna and Billfish Fishery (ETBF)	✓
Small Pelagic Fishery (SPF)	✓
Southern and Eastern Scalefish and Shark Fishery (SESSF): - Shark Gillnet Sector and Shark Hook Sector (SGSHS) - Commonwealth Trawl Sector (CTS) - Scalefish Hook Sector (SHS)	✓
Southern Bluefin Tuna Fishery (SBTF)	✓
Southern Squid Jig Fishery (SSJF)	✓

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020).

4.7.6.1. Bass Strait Central Zone Scallop Fishery (BSCZSF)

The Bass Strait Central Zone Scallop Fishery (BSCZSF) operates in the central area of Bass Strait between the Victorian and Tasmanian scallop fisheries. In 2021, fishing was permitted throughout the management area, except in 4 scallop beds that were closed to fishing under the harvest strategy. Fishing in 2021 was concentrated on beds in both eastern and western Bass Strait (Figure 4-66). Fishing involves towed scallop dredges that target dense aggregations (‘beds’) of scallops. Additional detail in Table 4-21.

Table 4-21: Bass Strait Central Zone Scallop Fishery (BSCZSF)

Aspects	Description
Primary landing ports	Beauty Point, Devonport, Stanley, Apollo Bay, Lakes Entrance, Melbourne, Port Welshpool, Queenscliff and San Remo
Target species	Commercial Scallop (*Pecten fumatus*)
Fishing season	12th July to 31st December
Licences / Active vessels (2021-2022)	35 fishing permits, 10 vessels were active in the fishery in 2021, a decrease from 26 active vessels in 2009, reflecting the ‘boom or bust’ nature of the fishery.
Recent catch within fishery	2021: 2,344 tonnes worth $4.7 million. 2020: 2,732 tonnes worth $5.3 million. 2019: 2,946 tonnes worth $6.3 million. 2018: 3,253 tonnes worth $6.7 million. 2017: 2,929 tonnes worth $6.7 million. 2016: 2,885 tonnes worth $4.6 million. 2015: 2,260 tonnes worth $2.8 million.
Catch in operational area	No known catch recorded
Harvest strategy	Utilise an ‘escapement’-based harvest strategy which establishes a fixed exploitation rate using information from an annual biomass survey to preserve a specified amount of the known spawning biomass through a combination of bed closures and a TAC that constrains the amount of catch across open beds. The biomass survey is conducted each year to determine whether or not it is appropriate to increase the Total Allowable Commercial Catch (TACC) above 150 t.
Sensitivities	Target species can be prone to die-off events (e.g. in 2010 and 2011) and disease (paralytic shellfish toxin in 2014). Target species is not listed under the EPBC Act.
Existing Pressures	Target species within the Bass Strait (between Victoria and Tasmania) are classified as a sustainable stock that is not subject to overfishing.

Aspects	Description
Overlap with the EMBA	There is complete overlap between the EMBA and the management area of the BSCZSF. The majority of catch occurs during September – December east of Flinders and east of King Island. Scallop spawning occurs from winter to spring (June to November), with timing dependent on environmental conditions such as wind and water temperature.
Stakeholder Feedback	No feedback specific to the BSCZSF was received during consultation.

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020)

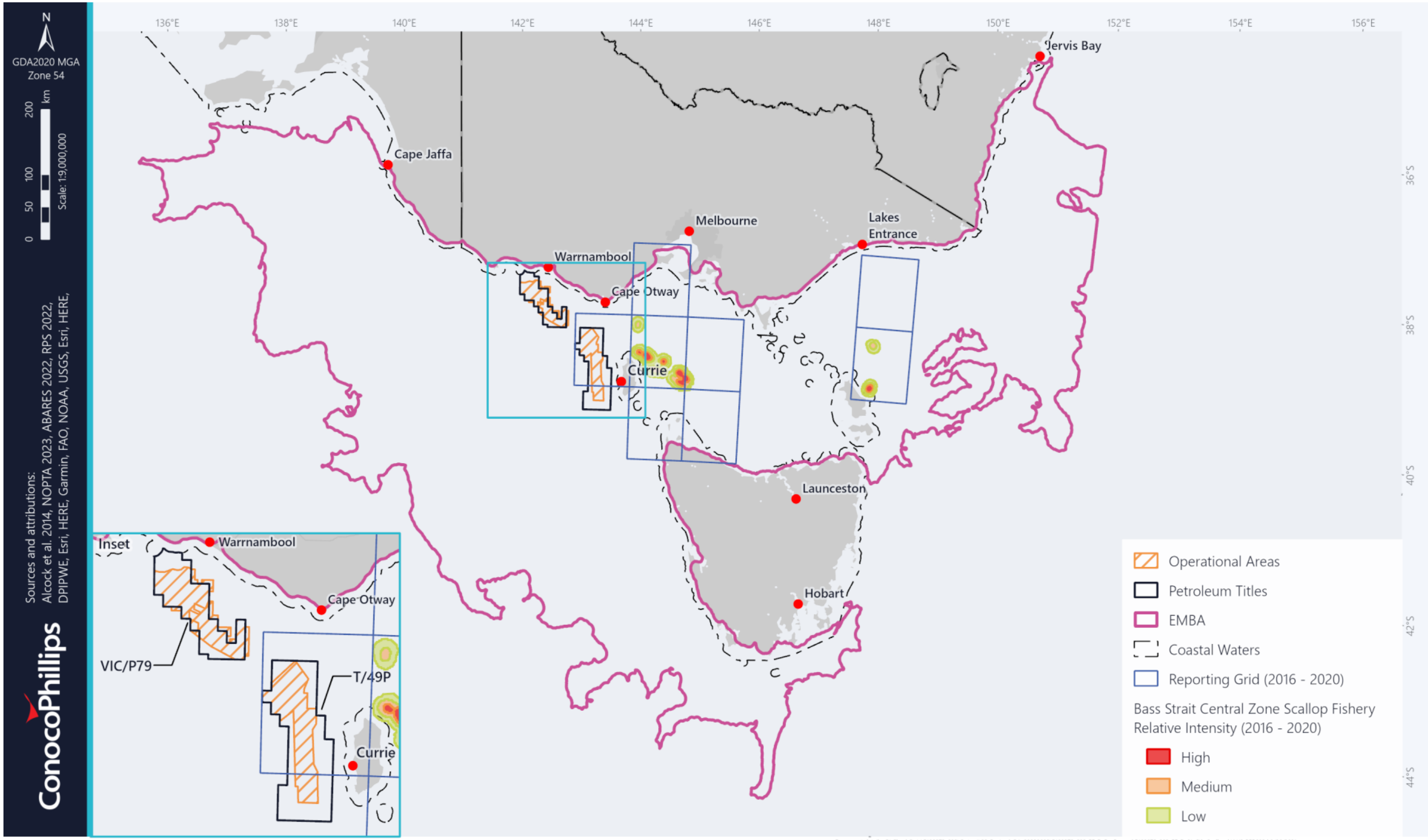


Figure 4-66: Area fished and relative fishing intensity in the Bass Strait Central Zone Scallop Fishery

4.7.6.2. Eastern Tuna and Billfish Fishery (ETBF)

The Eastern Tuna and Billfish Fishery (ETBF) operates in the Exclusive Economic Zone and adjacent high seas, from Cape York to the Victoria – South Australia border, including waters around Tasmania and the high seas of the Pacific Ocean (Figure 4-67). Pelagic longline is the key fishing method, with small quantities taken using minor line methods (such as handline, troll, rod and reel). Additional detail in Table 4-22.

Table 4-22: Eastern Tuna and Billfish Fishery (ETBF)

Aspects	Description
Primary landing ports	Bermagui, Coffs Harbour and Ulladulla (NSW), no Victorian or Tasmanian ports are currently used to land catches. However, during consultation we were made aware of a vessel that will be based out of Portland, Victoria. (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 471).
Target species	Albacore tuna (*Thunnus alulunga*), bigeye tuna (*T. obesus*), yellowfin tuna (*T. albacares*), broadbill swordfish (*Xiphias gladius*), striped marlin (*Tetrapturus audux*)
Fishing season	12-month season begins 1st March
Licences / Active vessels (2021-2022)	There are 35 active longline boats in the fishery and 82 Longline Statutory Fishing Rights (SFR) holders in the fishery. There are 12 active ETBF Minor line boats and 84 Minor Line SFR holders. This means there is potential for 166 boats to operate in the fishery (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 471).
Recent catch within fishery	2021: 5,148 t worth $35.6 million. 2020: 5,239 t worth $39.8 million. 2019: 4,341 t worth $32.1 million. 2018: 4,046 t worth $38.4 million. 2017: 4,624 t worth $35.7 million. 2016: 5,139 t worth $47.1 million. 2015: 5,408 t worth $33 million.
Catch in operational area	No known catch has been recorded within the operational areas; however, during consultation we were made aware of a trial conducted in early 2023 near the operational area which demonstrated good productivity. We have also been advised that the vessel recently sold into the Portland area will likely work the shelf break near operational areas (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 471).
Harvest strategy	The strategy is developed to set the TAC for 2 of the 5 species (swordfish and striped marlin). A review by the Tropical Tuna and Billfish Fisheries Resource Assessment Group concluded that changes to Australia's catch would not likely lead to significant changes to stock levels. As a result, harvest strategies are not used to calculate recommended biological commercial catch levels for albacore, bigeye tuna and yellowfin tuna.
Sensitivities	Target species is not listed under the EPBC Act.
Existing Pressures	All but one target species is classified as sustainable stock that are not subject to overfishing. The striped marlin is classified as overfished due to the populations median estimate of spawning biomass, but it is not subject to overfishing.
Overlap with the EMBA	The eastern boundary of the EMBA intersects an area of medium to high fishing intensity.
Stakeholder Feedback	Feedback was received during consultation on the need to update the information in this table to reflect recent changes in and emerging trends in the fisheries (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 471). Feedback was received during consultation requesting provision of historical observations of tuna in and requesting a 48 hour lookahead to tuna fishing associations (Org ID: 6, Tuna Australia, Event ID 4174, FB ID: 463, 464). Feedback regarding impacts to ETBF stock species and fishing grounds was received (Org ID: 479, Event ID: 3821, FB ID: 415), with relevant persons seeking compensation. ConocoPhillips Australia has committed to a Commercial Marine Operators Adjustment Protocol (CM04). Feedback was also received related to seismic survey impacts on the SBTF (Org ID: 406, Event ID: 3850, FB ID: 400), and the relevant person was directed to companies proposing to conduct seismic surveys.

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020)

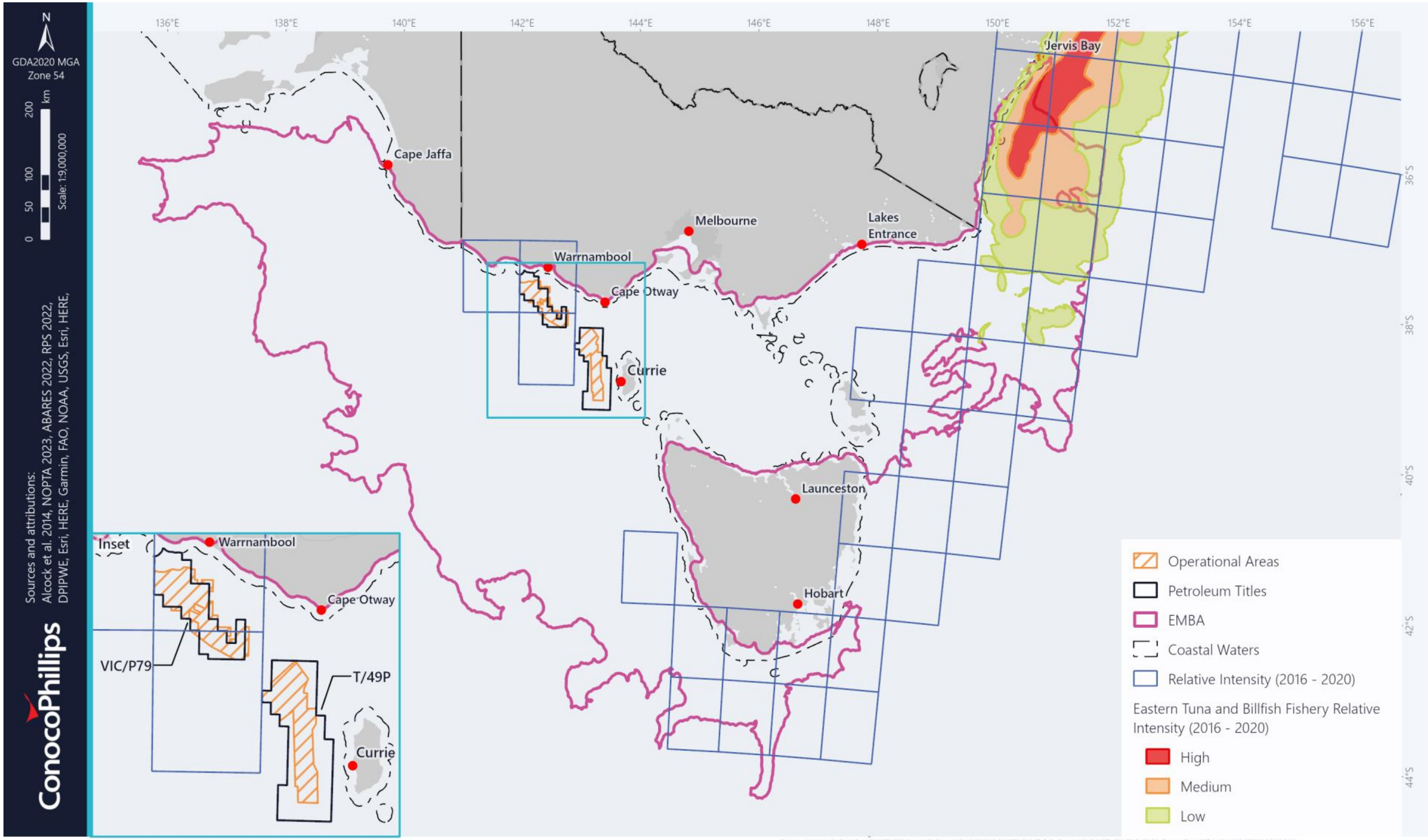


Figure 4-67: Area fished and relative fishing intensity in the Eastern Tuna and Billfish Fishery

4.7.6.3. Small Pelagic Fishery (SPF)

The Small Pelagic Fishery (SPF) extends from southern Queensland to southern WA within Commonwealth waters (Figure 4-68) with the fishery having 3 subareas, each with its own stock-level total allowable catch (TAC). The fishery includes purse-seine and midwater trawl fishing vessels with the latter being the main method. Additional detail in Table 4-23.

Table 4-23: Small Pelagic Fishery

Aspects	Description
Primary landing ports	The main landing ports are Iluka and Ulladulla in NSW
Target species	Australian sardine (*Sardinops sagax*), Jack mackerel (*Trachurus declivis*), blue mackerel (*Scomber australasicus*), redbait (*Emmelichthys nitidus*)
Fishing season	12-month season begins 1st May
Licences / Active vessels (2021-2022)	33 entities held licences in 2021-2022 using 6 active vessels.
Recent catch within fishery	2021: 19,392 t 2020: 13,766 t 2019: 16,200 t 2018: 16,093 t 2017: 9,424 t 2016: 5,713 t 2015: 8,038 t
Catch in operational area	No known catch recorded
Harvest Strategy	There are three tiers with static exploitation rates for each tier and stock. Different tiers reflect the time since the estimate of spawning biomass was obtained using the daily egg production method. Tier 1 allows for the highest exploitation rates and tier 3 for the lowest.
Sensitivities	Target species is not listed under the EPBC Act.
Existing Pressures	Target species are classified as sustainable stock that are not subject to overfishing.
Overlap with the EMBA	The EMBA intersects areas with reported catch. The TAC has not been reached in recent years. Some catch and effort values are confidential due to the small number of fishers.
Stakeholder Feedback	No feedback specific to the SPF was received during consultation.

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020).

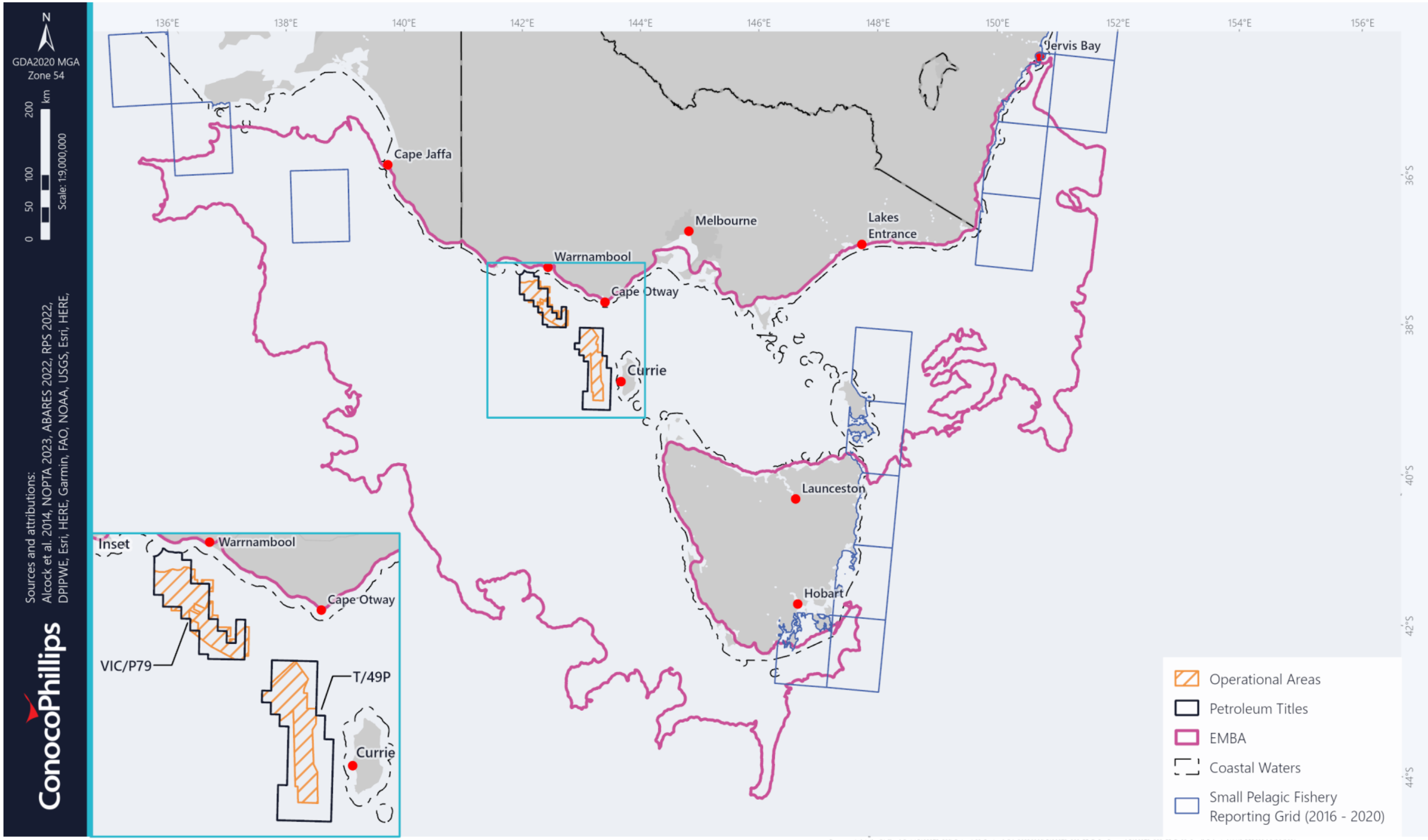


Figure 4-68: Area fished in the Small Pelagic Fishery

4.7.6.4. Southern and Eastern Scalefish and Shark Fishery (SSESF)

The Southern and Eastern Scalefish and Shark Fishery (SSESF) is a multisector, multigear and multispecies fishery, targeting a variety of stocks. The management area covers almost half the area of the Australian Fishing Zone and spans both Commonwealth waters and the waters of several Australian states (Patterson et al. 2022). Current management arrangements in the SESSF are structured around the 4 primary sectors of the fishery: the Commonwealth Trawl Sector (CTS), the East Coast Deepwater Trawl Sector, the Great Australian Bight Trawl Sector and the Gillnet, Hook and Trap Sector (GHTS). The GHTS includes the Shark Gillnet and Shark Hook sectors (SGSHS), the Scalefish Hook Sector (SHS), and the Trap Sector. The EMBA intersect with the SGSHS, SHS and the CTS which are described in detail below.

Shark Gillnet Sector and Shark Hook Sector (SGSHS)

The Shark Gillnet Sector (Figure 4-69) and Shark Hook Sector (Figure 4-70) use demersal gillnet and longline to target Gummy Sharks and are restricted to waters shallower than 183 m (SETFIA and Fishwell Consulting 2018). The fishery extends from waters from the NSW/Victorian border westward to the SA/WA border, including the waters around Tasmania, from the low water mark to the extent of the AFZ. Most fishing occurs in waters adjacent to the coastline in Bass Strait. Fishery catch statistics for this sector are provided in Table 4-24.

Table 4-24: SSESF – Shark Gillnet and Shark Hook Sector (SGSHS)

Aspects	Description
Primary landing ports	Adelaide, Port Lincoln, Robe (SA); Lakes Entrance, San Remo, Port Welshpool (Vic); Devonport, Hobart (Tas)
Target species	Gummy shark (*Mustelus antarcticus*) is the key target species, with bycatch of elephant fish (*Callorhinchus milii*), sawshark (*Pristiophorus cirratus, P. nudipinnis*), and school shark (*Galeorhinus galeus*). Gummy shark made up approximately 67% of the catch in the 2021-22 fishing season.
Fishing season	12-month season begins 1st May
Licences / Active vessels (2021-2022)	73 permits / 67 active vessels
Recent catch within fishery	2021: 2,489 t with no assigned value. 2020: 2,516 t worth $22.61 million. 2019: 2,201 t worth $19.7 million. 2018: 2,126 t worth $23.6 million. 2017: 2,126 t worth $19.1 million. 2016: 2,118 t worth $18.3 million. 2015: 2,233 t worth $18.4 million.
Catch in operational area	Shark Gillnet sub-sector: The operational areas overlap areas of low, medium and high fishing intensity between 2016-2021 by approximately 1.54%, 0.52% and 0.77% respectively. Therefore, the Otway Exploration Drilling Program is not expected to impact fishery performance. Shark Hook sub-sector: No known catch recorded
Harvest Strategy	The four principal target species are managed under the SESSF Harvest Strategy Framework (AFMA 2020). There is also the school shark Stock Rebuilding Strategy (AFMA 2015) whereby school shark is subject to an incidental catch limit, and other measures to reduce targeting and catch. Spatial closures are implemented across the fishery to protect school shark breeding populations, pupping and nursery areas, and school and gummy shark habitat, and to promote the recovery of upper-slope dogfish stocks.
Sensitivities	School shark is listed under the EPBC Act as conservation dependent. The 3 other species are not.
Existing Pressures	Fishing pressure has been identified as the key threat for school shark in south eastern Australia, with historical fishing effort having depleted stocks to below 20% of unfished levels. Stocks of other principal target species are classified as sustainable stock and not currently subject to overfishing.
Overlap with the EMBA	The western boundary of the EMBA intersects an area of low fishing intensity.
Stakeholder Feedback	No feedback specific to the SGSHS was received during consultation.

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020); AFMA (2020; 2015)

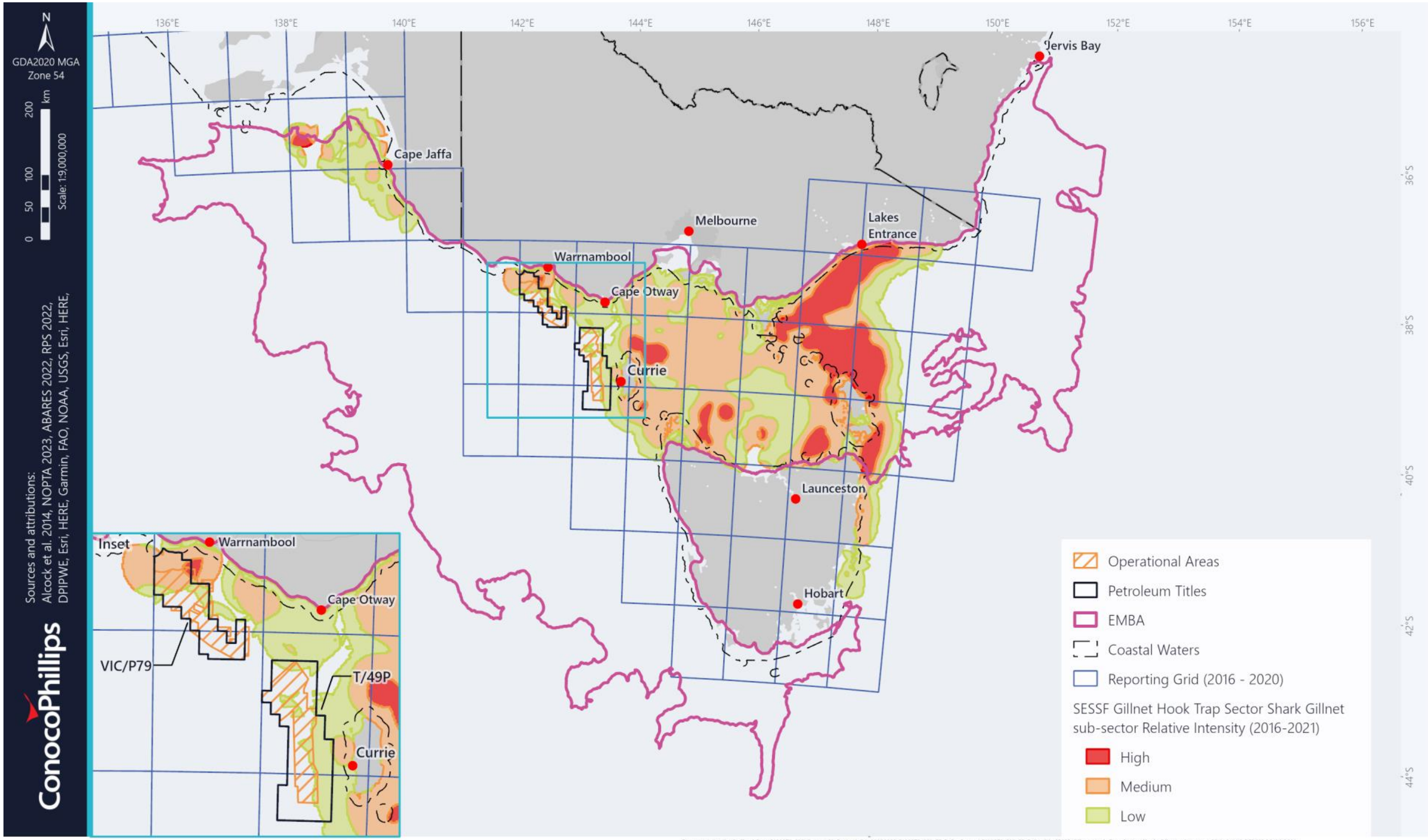


Figure 4-69: Area fished and relative fishing intensity in the SESSF – Shark Gillnet Sector

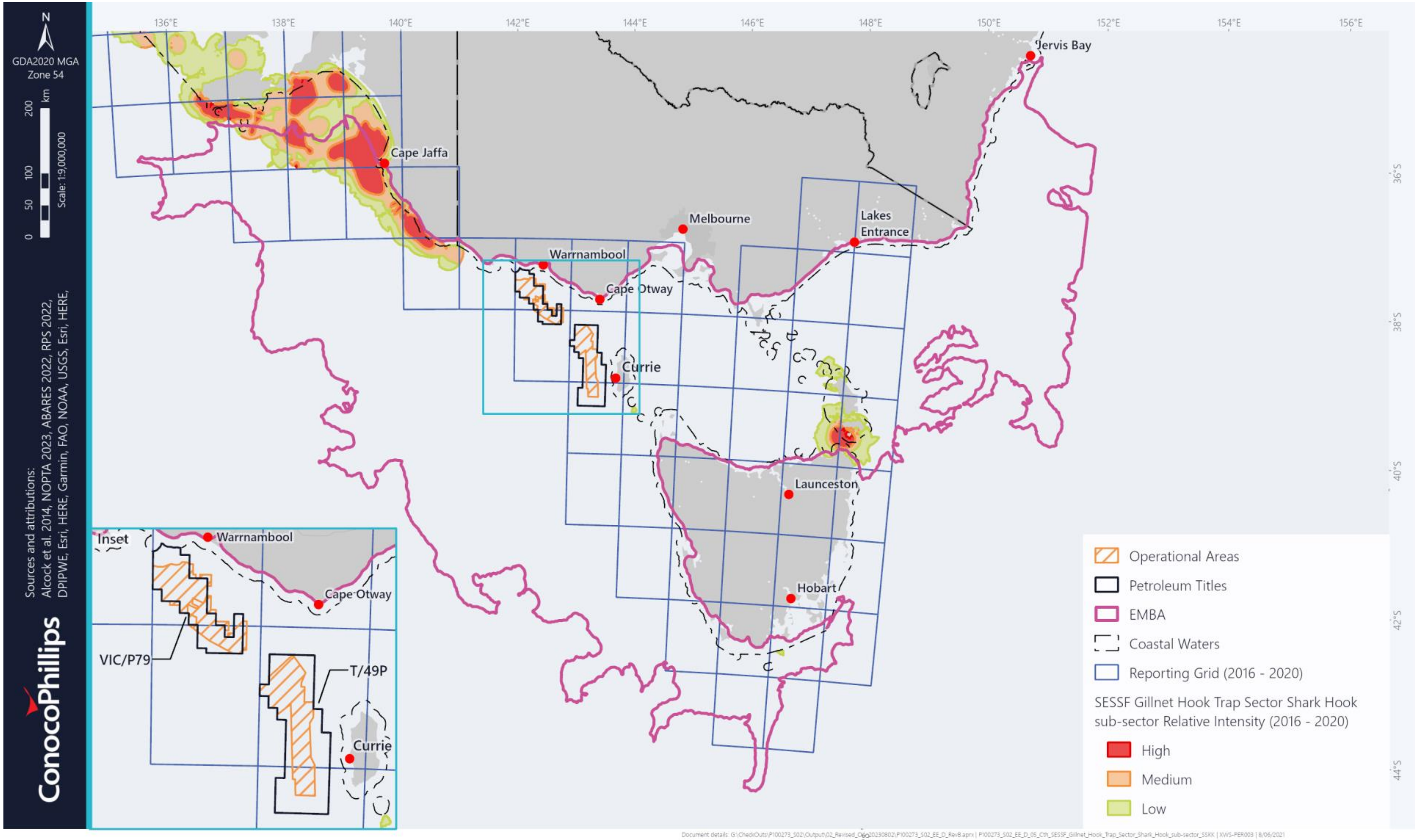


Figure 4-70: Area fished and relative fishing intensity in the SESSF – Shark Hook Sector

Commonwealth Trawl Sector (CTS)

The Commonwealth Trawl Sector (CTS) of the SESSF lies in AFZ waters extending from Cape Jervis (SA) around the Victorian, Tasmanian and NSW coastlines northward to Barranjoey Point (Figure 4-71 and Figure 4-72). This sector utilises demersal otter-board trawl and Danish-seine equipment to target demersal species. The waters south-west of King Island are fished by the otter-board sector (Patterson et al. 2020) (Figure 4-71) and Danish-seine vessels fish to the east of King Island (Patterson et al. 2020) (Figure 4-72). Data shows fishing activity for the CTS primarily occurs along the continental shelf spanning. The T/49 operational area overlaps the combined five years of low intensity data by 0.8% and has no overlap with moderate or high intensity fishing areas. The VIC P/79 operational areas overlap the combined five years of low and medium intensity data by 1.61% and 1.45 % respectively with no overlap with high intensity fishing areas. Fishery catch statistics for this sector are provided in Table 4-25.

Table 4-25: SSESF - Commonwealth Trawl Sector (CTS)

Aspects	Description
Primary landing ports	Eden, Sydney and Ulladulla (NSW); Hobart (Tas); Lakes Entrance and Portland (Vic)
Target speceis	Key species targeted are: blue grenadier (*Macruronus novaezelandiae*), tiger flathead (*Neoplatycephalus richardsoni),* orange roughy (*Hoplostethus atlanticus*) - eastern zone, pink ling (*Genypterus blacodes*) and eastern school whiting (*Sillago flindersi*)
Fishing season	12-month season begins 1st May.
Boat statutory fishing rights^ / active vessels (2021-2022)	57 trawl fishing rights / 32 active trawl vessels.
Recent catch within fishery*	2021: 22,559 t with no assigned value. 2020: 22,857 t worth $64 million. 2019: 13,072 t worth $51.34 million. 2018: 8,454 t worth $49.47 million. 2017: 8,631 t worth $41.86 million. 2016: 8,691 t worth $46.42 million. 2015: 9,025 t worth $41.5 million.
Catch in operational area	Operational areas overlap area designated as low intensity fishing in T/49P operational area (<0.5 hours/km^2) and low and medium intensity fishing in VICP/79 operational areas for each year between 2016 and 2021. There is minimal overlap with fishing areas, therefore the Otway Exploration Drilling Program is not expected to impact fishery performance.
Harvest strategy	All species are included in the strategy and subject to quota (including target and nontarget species) in the SESSF. A tiered approach is utilised to apply different types of assessments and cater for different amounts of available data for different stocks. The strategy adopts increased levels of precaution that correspond to increasing levels of uncertainty about stock status, in order to reduce the level of risk associated with uncertainty. In this approach, each stock is assessed using one of three types of assessment depending on the amount and type of information available to assess stock status, where Tier 1 represents the highest quality of information available.
Sensitivities	The orange roughy is listed as conservation dependent under the EPBC Act and is managed under AFMA's Orange Roughy Rebuilding Strategy. No other sensitivities were identified for the CTS fishery.
Existing pressures	Target species include the gummy shark plus the Eastern school whiting and tiger flathead. All primary target species within the CTS identified within the South Eastern Australia biological stock are classified as a sustainable stock that are not subject to overfishing.
Overlap with the EMBA	The EMBA intersects areas with reported catch.
Stakeholder Feedback	No feedback specific to the SSESF – CTS was received during consultation.

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020)
* Scalehook Shark Sector is reported along with CTS as most stocks are shared (Patterson et al. 2022).

^ Statutory fishing rights allow fishers to fish in the fishery and catch the fish species that are under a quota. The amount of quota an operator is allocated depends on the amount of rights they hold. The amount of quota changes every year. Statutory fishing rights are transferable between fishers, they may also be known as individually transferable quota (AFMA 2021).

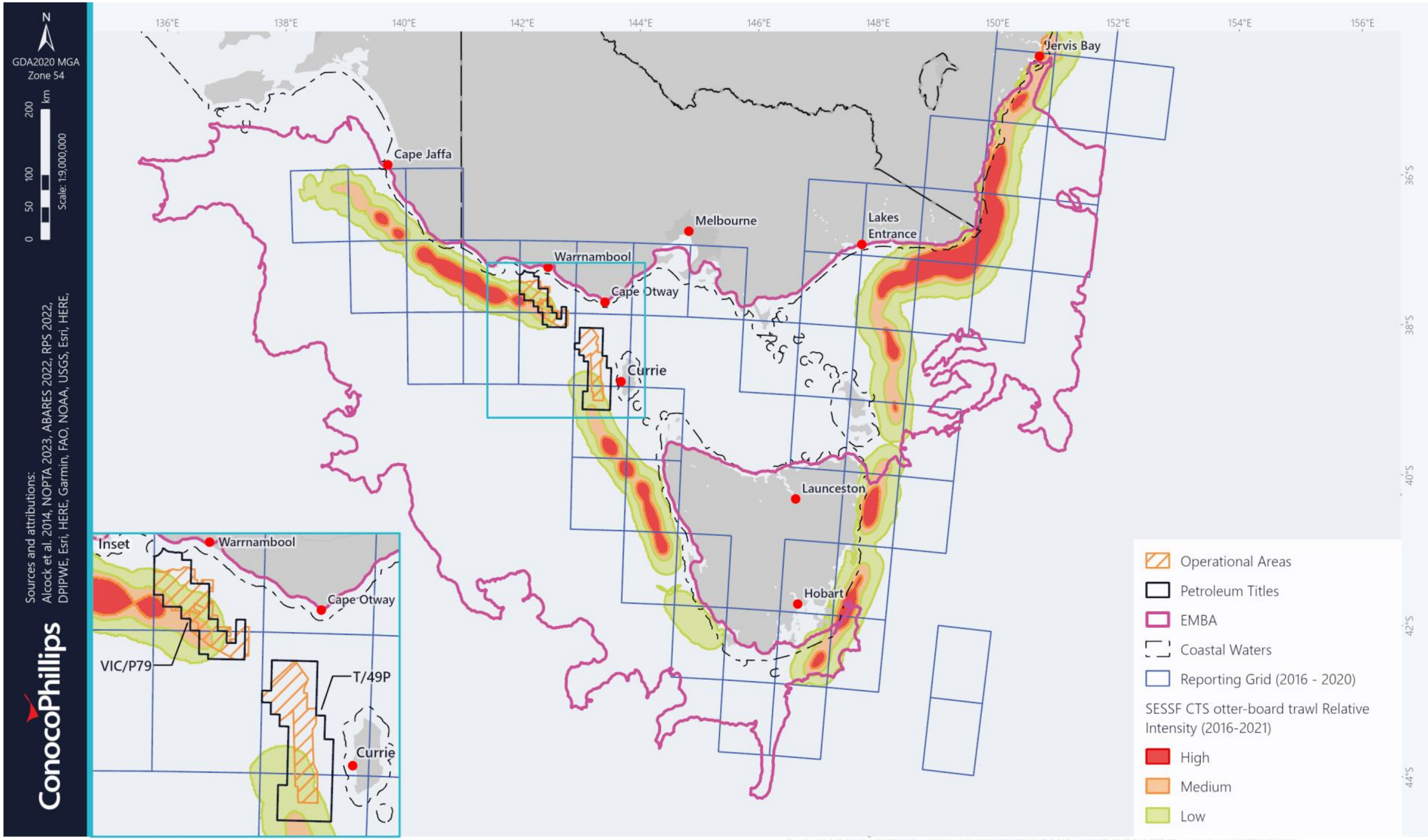


Figure 4-71: Area fished and relative fishing intensity in the SESSF – Commonwealth Trawl Sector (otter-board trawl)

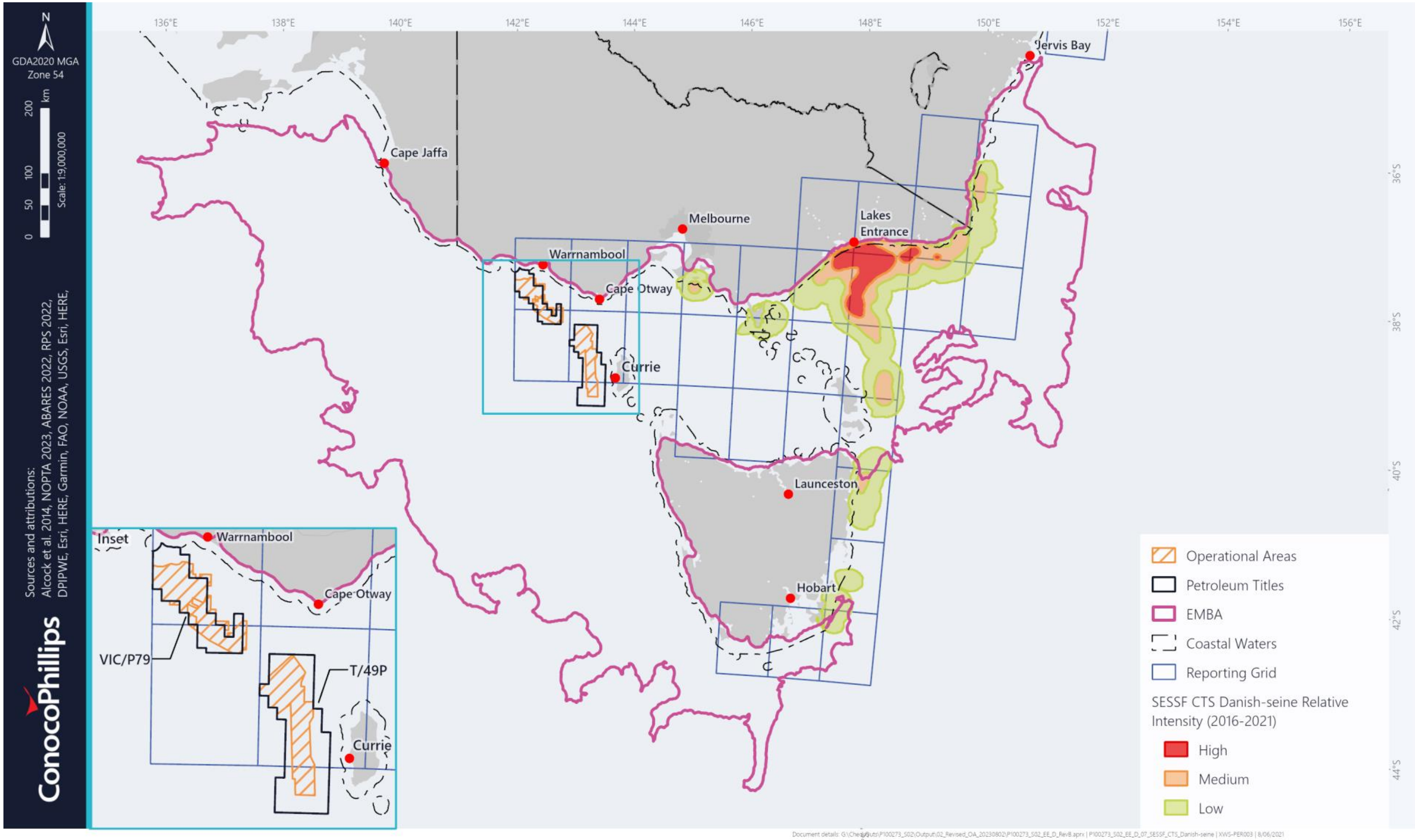


Figure 4-72: Area fished and relative fishing intensity in the SESSF – Commonwealth Trawl Sector (Danish-seine)

Scalefish Hook Sector (SHS)

The Scalefish Hook Sector uses demersal longlines to target pink ling (*Genypterus blacodes*) and blue-eye trevalla (*Hyperoglyphe antarctica*) and is restricted to waters deeper than 183 m (SETFIA and Fishwell Consulting 2018). Includes all waters off South Australia, Victoria and Tasmania from 3 nm to the extent of the AFZ. Fishery catch statistics for this sector are provided in Table 4-26.

Table 4-26: SESSF – Scalefish Hook Sector (SHS)

Aspects	Description
Primary landing ports	Adelaide, Port Lincoln, Robe (South Australia); Devenport, Hobart (Tasmania); Lakes Entrance, San Remo, Port Welshpool (Victoria)
Target species	Key species targeted from 2021 season were: pink ling (*Genypterus blacodes*), blue-eye trevalla (*Hyperoglyphe antarctica*) and ribaldo (*Mora moro*). Other targeted species include elephantfish (Callorhinchus milii), gummy shark (Mustelus antarcticus), sawshark (Pristiophorus cirratus, P. nudipinnis), school shark (Galeorhinus galeus).
Fishing season	12-month season begins 1st May with highest effort between January and July
Permits / active vessels (2021-2022)	37 scalefish hook fishing rights / 32 active trawl vessels.
Recent catch within fishery*	2021: 22,559 t with no assigned value. 2020: 22,857 t worth $64 million. 2019: 13,072 t worth $51.34 million. 2018: 8,454 t worth $49.47 million. 2017: 8,631 t worth $41.86 million. 2016: 8,691 t worth $46.42 million. 2015: 9,025 t worth $41.5 million.
Catch in operational area	No known catch recorded
Harvest strategy	As per the SESSF: Commonwealth Trawl Sector (CTS)
Sensitivities	The SHS also targets gummy shark, see SGSHS above. No other sensitivities were identified for the SHS fishery.
Existing pressures	The school shark is a target species within the SHS, see SGSHS above for current fishing pressure. Other targeted species within the fishery are classified as a sustainable stock and are not subject to overfishing.
Overlap with the EMBA	The EMBA intersects areas with reported catch.
Stakeholder Feedback	No feedback specific to the SESSF – SHS was received during consultation.

Sources: Patterson et al (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020)
*The SHS is reported along with CTS as most stocks are shared (Patterson et al. 2022).

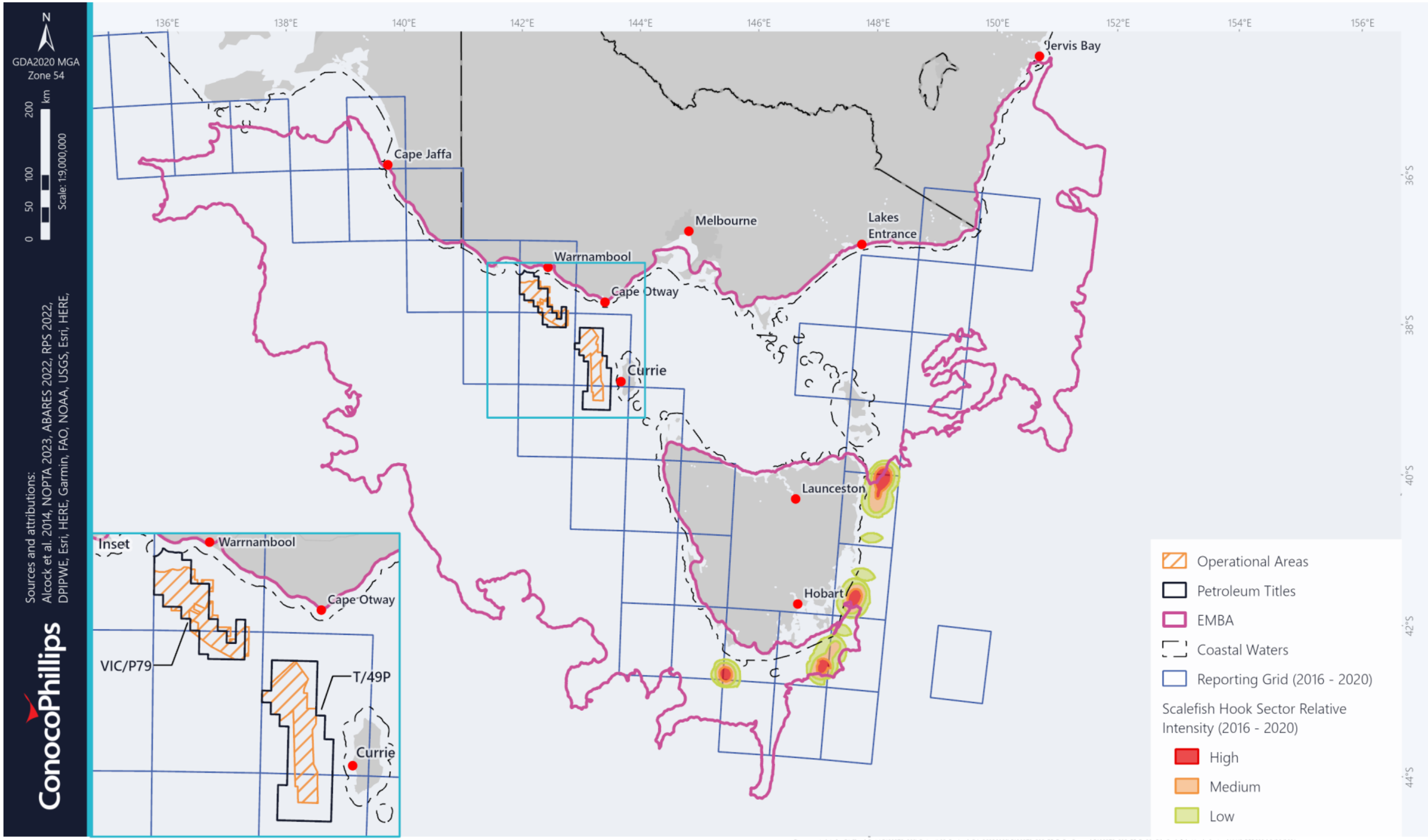


Figure 4-73: Area fished and relative fishing intensity in the SESSF – Scalefish Hook Sector

4.7.6.5. Southern Bluefin Tuna Fishery (SBTF)

The Southern Bluefin Tuna Fishery (SBTF) extends throughout all waters of the AFZ (Figure 4-74). However, the nearest fishing effort to the EMBA is concentrated along the NSW south coast around the 200 m depth contour, the north and east coast of Tasmania and south-east off Kangaroo Island, SA. On the east coast of Australia, pelagic longline fishing is the key fishing method and off the south-east coast of South Australia purse seines fishing is the key method of fishing method. Fishery catch statistics for this sector are provided in Table 4-27.

Table 4-27: Southern Bluefin Tuna Fishery (SBTF)

Aspects	Description
Primary landing ports	Port Lincoln (South Australia). During consultation we were made aware of a vessel that will be based out of Portland, Victoria and operators considering using Tasmanian ports as part of their fishing strategy (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 471).
Target species	Southern bluefin tuna (*Thunnus maccoyii*)
Fishing season	12-month season begins 1st December
Licences / Active vessels (2020-2021)	11-24 active long-line vessels during the past 10 years 5-8 purse-seine vessels
Recent catch within fishery	No recent fishing effort in Bass Strait. The latest data for the east coast pelagic longline and purse-seine catches are: 2022: 6,653 t (4,607 t for purse-seine and 1,039 t for pelagic longline) worth $35.45 million ($28.07 M for purse-seine* and $7.42 M for pelagic longline). 2021: 5,927 t (4,957 t for purse-seine and 1,015 t for pelagic longline) worth $35.49 million ($29.95 M for purse-seine* and $5.49 M for pelagic longline). 2020: 5,646 t worth $41.39 million. 2019: 5,429 t worth $41.27 million. 2018: 6,074 t worth $43.41 million. 2017: 5,334 t worth $38.57 million. 2016: 5,636 t worth $37.29 million. *Purse-seine GVP data represent the value of catch as farm input to aquaculture operations. The farm gate value of this catch, after grow out, was $91.0 million in 2020–21 and (based on the value of southern bluefin tuna exports) an estimated $117.47 million in 2021–22, representing the value of farmed southern bluefin tuna exports in those years. Pelagic longline GVP is the beach value of landed catch that is sold direct to consumer markets.
Catch in operational area	No known catch has been recorded within the operational areas; however, during consultation we were made aware of a trial conducted in early 2023 near the operational area which demonstrated good productivity. We have also been advised that a vessel based in the Portland area will likely work the shelf break near operational areas and increased effort is likely from Tasmania into the western side of Bass Strait (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 471).
Harvest Strategy	In 2019, the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) adopted a new management procedure that aims to rebuild the southern bluefin tuna stock. The new procedure has been used to set the global total allowable catch from 2021. The AFMA sets the total allowable commercial catch for the SBTF, with reference to Australia's CCSBT allocation, using individual transferable quotas.
Sensitivities	The southern bluefin tuna is listed under the EPBC Act as conservation dependent.
Existing Pressures	The target species is classified as sustainable stock that is not subject to overfishing.
Overlap with the EMBA	The western boundary of the EMBA intersects areas fished with purse seines and the south eastern boundary of the EMBA intersects with longlines fishing area.
Stakeholder Feedback	Feedback was received from Tuna Australia on the need to update the data in this table to reflect both the long-line and purse-seine fisheries and recent changes in and emerging trends in the fisheries (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 471). The ABAREs Fishery Status Reports (2023) were reviewed and data for the 2021 and 2022 seasons, for both the long-line and purse-seine fisheries, was added above.

	Feedback was received during consultation requesting provision of historical observations of tuna in the area and requesting a 48 hour lookahead be provided to tuna fishing associations (Org ID: 6, Tuna Australia, Event ID 4174, FB ID: 463, 464). Feedback was also received related to seismic survey impacts on the SBTF (Org ID: 406, Event ID: 3850, FB ID: 400), and the relevant person was directed to companies proposing to conduct seismic surveys.

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020); ABARES Fishery Status Reports 2023.

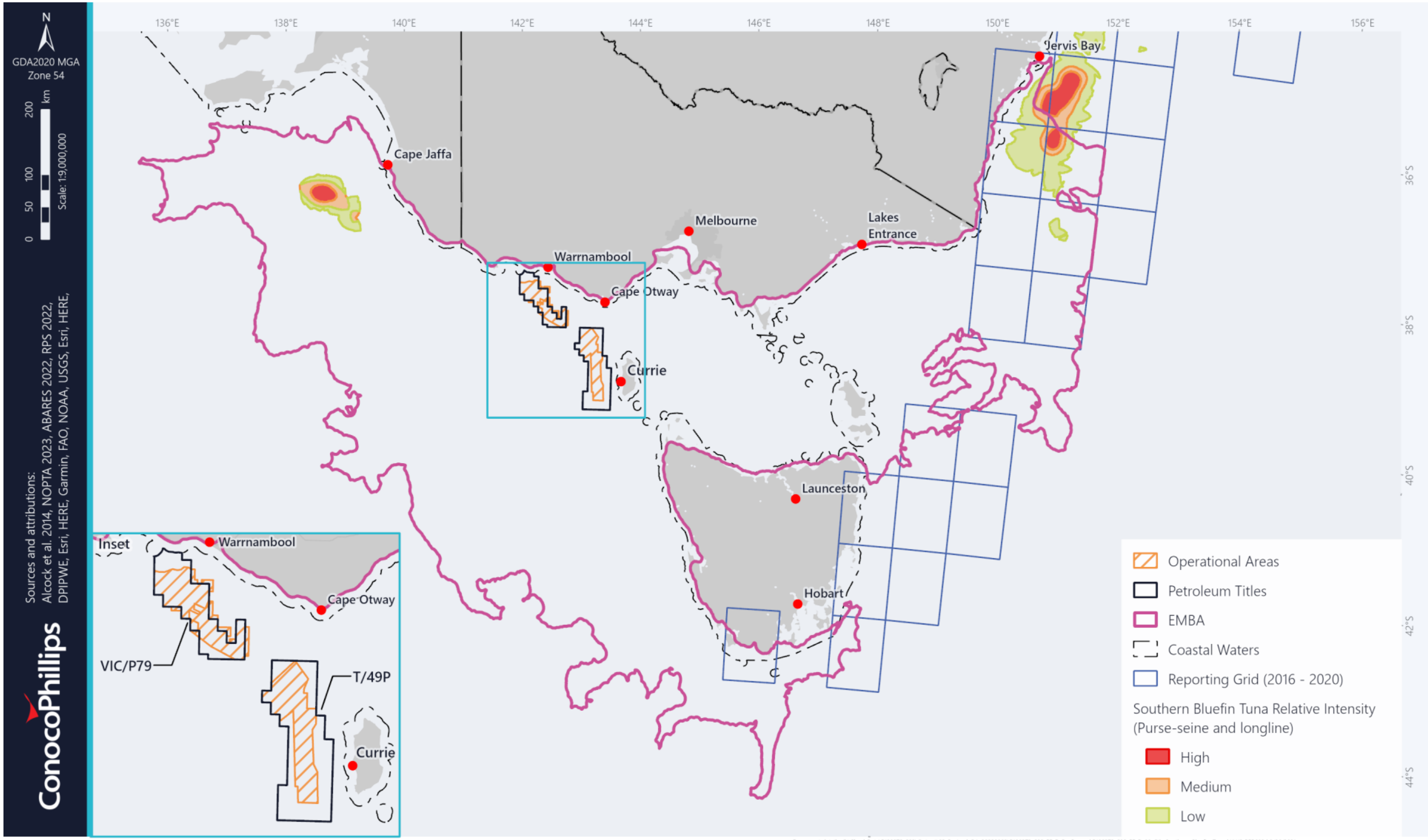


Figure 4-74: Purse-seine effort and longline catch in the Southern Bluefin Tuna Fishery

4.7.6.6. Southern Squid Jig Fishery (SSJF)

The Southern Squid Jig Fishery (SSJF) lies in AFZ waters extending from the Queensland/NSW border to the SA/WA border (excluding coastal waters) targeting Gould's squid by squid jig methods (Figure 4-75). Fishing is carried out in continental shelf waters in depths targeting 60 – 120 m (Patterson et al. 2020). Waters outside of Port Phillip Bay are usually fished in February and early March and in western Victoria from January to June with highest catches traditionally concentrated in April and May (ABARES 2018). The squid are present sporadically in high abundances in Tasmanian state waters in late summer/early autumn (Noriega et al. 2021). The species' short life span, fast growth and sensitivity to environmental conditions result in highly variable recruitment and strongly fluctuating stock sizes (Jackson and McGrath-Steer 2003), making it difficult to estimate biomass before a fishing season. The success of squid jigging is greatly affected by weather; heavy winds and swells in Bass Strait in winter effectively halt the jig fishery. Moon phase also influences the catchability of Gould's squid with lower catch rates close to the full moon (ABARES 2018). Squid are also caught by the Commonwealth Trawl Sector (CTS) and the Great Australian Bight Trawl Sector (GABTS) and in recent years more squid has been landed by these fisheries than the SSJF. Most fishing takes place off Portland (March to June) at night between depths of 60 and 120 m (Patterson et al. 2018). Fishery catch statistics for this sector are provided in Table 4-28.

Table 4-28: Southern Squid Jig Fishery

Aspects	Description
Primary landing ports	Apollo Bay and Queenscliff (Vic); Triabunna (Tas)
Target species	Gould's squid (*Nototodarus gouldi*)
Fishing season	1 January to 31 December. Actual fishing January and June (highest catch generally March, April)
Licences / Active vessels (2021-2022)	8 active vessels
Recent catch within fishery	2021: 939 t worth $3.3 million. 2020: 480 t worth $2.14 million. 2019: 722 t worth $2.89 million. 2018: 1,649 t worth $5.26 million. 2017: 828 t worth $2.24 million. 2016: 981 t worth $2.57 million. 2015: 824 t worth $2.33 million.
Catch in Operational Area	The VICP/79 operational area overlaps areas of low, medium and high fishing intensity between 2016-2021 by approximately 15.95%, 25.01% and 36.1% respectively. Further assessment of the potential impact of the Otway Exploration Drilling Program on the Southern Squid Jig Fishery occurs in Section 6.2.4.7.
Harvest Strategy	The strategy provides a system of within-season monitoring against catch-and-effort triggers for the jig and trawl sectors. This has been implemented because of difficulties in collecting real-time catch, effort and size data, and growth estimates needed for within-season depletion analyses.
Sensitivities	The Gould's squid does not have an EPBC listed status.
Existing Pressures	Target species classified as sustainable stock that is not subject to overfishing.
Overlap with the EMBA	The eastern boundary of the EMBA intersects with an area of low – high fishing intensity. TAC in recent years has not been reached. Some catch and effort values are confidential due to the small number of fishers.
Stakeholder Feedback	Feedback was received during consultation regarding the displacement of fishers and light emissions attracting squid away from fishing locations resulting in a loss of catch (Org ID: 471, Richey Fishing Co Pty Ltd, Event ID: 536, FB ID: 11). ConocoPhillips Australia has committed to a Commercial Marine Operators Adjustment Protocol (CM04) and has assessed the impact of light on squid in section 6.4.5.3.

Sources: Patterson et al. (2022; 2021; 2020; 2019; 2018; 2017; 2016), SETFIA and Fishwell Consulting (2020).

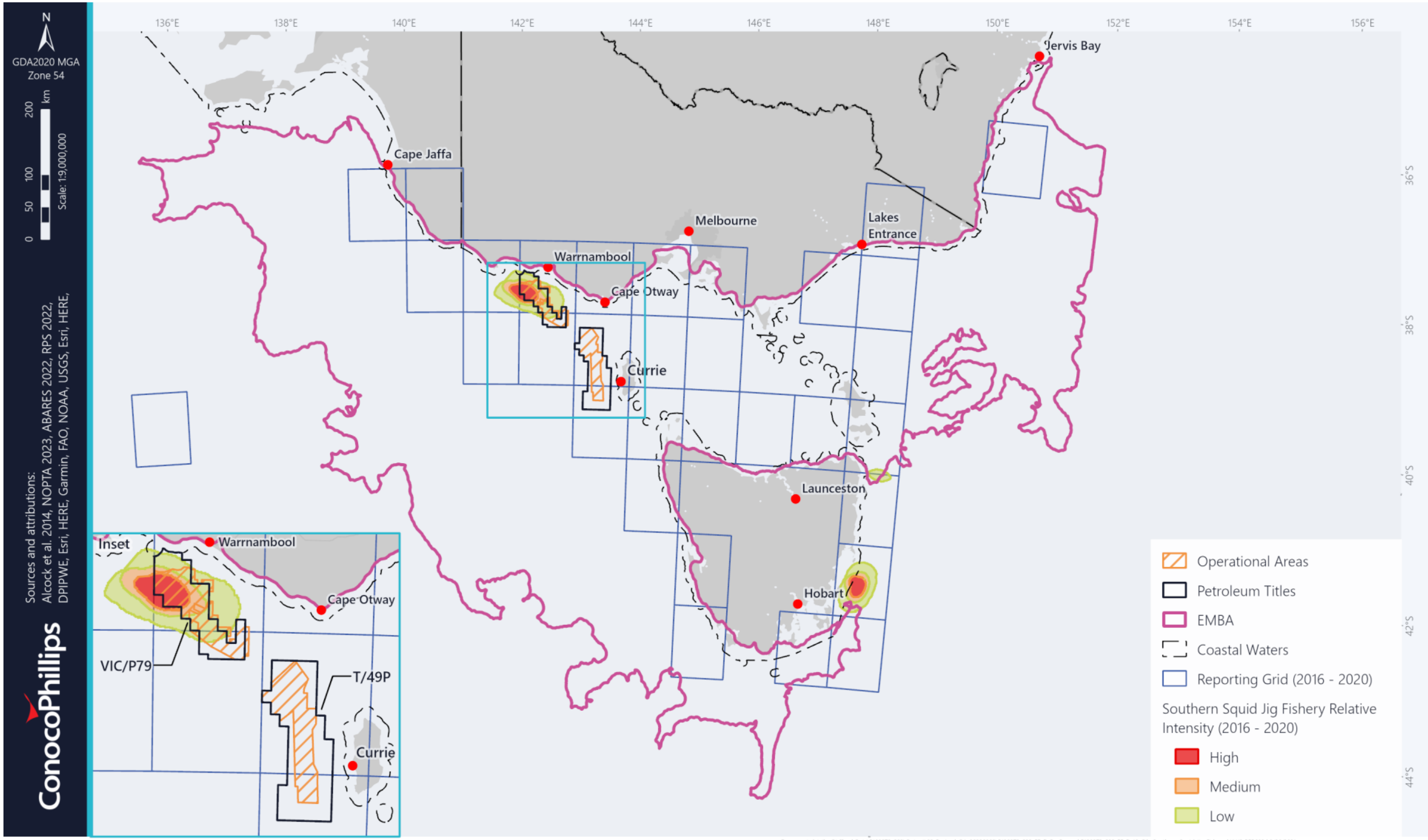


Figure 4-75: Area fished and relative fishing intensity in the Southern Squid Jig Fishery and Commonwealth Trawl Sector squid catch

4.7.7. Victorian Managed Fisheries

Victorian state fisheries are managed by the Victorian Fisheries Authority (VFA) under the State Fisheries Act 1995. VFA jurisdiction extends offshore to 3 nautical miles with additional offshore constitutional settlements for specific fisheries beyond state boundaries into Commonwealth waters. Victorian-managed commercial fisheries with access licences that authorise harvest in the EMBA are detailed in Table 4-29. Though certain fisheries possess jurisdiction to fish within the EMBA, analysis of publicly available and requested catch data indicates that not all fisheries have recently actively fished in this area.

Table 4-29: Victorian state managed fisheries within the EMBAs

Victorian-managed Fisheries	Recorded fishing in the EMBAs in the last 10 years
Abalone	Not known[1]
Bays and Inlet	Not known[2]
Eel	Not known[3]
Giant Crab	✓
Multi-species Ocean	✓
Octopus	✓
Pipis	✓
Rock Lobster	✓
Scallop	✓
Scallop Dive (Port Phillip Bay)	Not known[1]
Sea Urchin	✓
Wrasse	✓

Source: SETFIA and Fishwell Consulting (2020); VFA (2022).
1 Insufficient data to report because as less than five license holders (policy requirement to protect commercial confidentiality of data)
2 Data not currently supplied
3 VFA unable to report area level data due to confidentiality (low vessel numbers)

4.7.7.1. Rock Lobster Fishery

The Victorian Rock Lobster Fishery extends from the Victorian coastline to latitude 40°S (between 140°57.9'S and 143°40' E) and 39°12'S (between 143°40'E and 150°20'E) (Figure 4-76). The operational area lies within the 'western zone' of this fishery defined as the area between Apollo Bay and the SA/Victorian border. The fishery primarily targets the southern rock lobster (SRL) (*Jasus edwardsii*) using baited lobster pots (SETFIA and Fishwell Consulting 2018). SRL are fished from coastal reefs in waters up to approximately 150 m water depth with most of the catch coming from inshore waters less than 100 m deep (DEWHA 2007). Pots are generally set and retrieved each day and marked with a surface buoy. Fishery catch statistics for this sector are provided in Table 4-30.

Table 4-30: Victorian Southern Rock Lobster Fishery

Aspects	Description
Primary landing ports	Portland, Port Fairy, Warrnambool, Port Campbell, Apollo Bay
Target species	Southern Rock Lobster (*Jasus edwardsii*)
Fishing season	Fishery closed: • 15 September to 15 November: protect males during moulting period • 1 June to 15 November: protect females in berry (with eggs attached)
Licences / Active vessels (2019-2020) - (Western Zone)	Maximum number licences: 71. 43 active vessels (2019/20) In 2019/20 the average number of days fished by each vessel was 48.

Recent catch within fishery	Catches for the western zone for the last five available seasons: 2021: 318.9 t with no assigned value. 2020: 258.5 t with no assigned value. 2019: 225 t with no assigned value. 2018: 245 t valued at $22 million. 2017: 230 t valued at $18.6 million.
Overlap with operational area	The operational areas overlap 11 of the 53 reporting blocks recording vessel activity within the SRL fishery, nine of which report <5 vessels. The remaining blocks range between five and seven vessels.
Catch in operational area	Not available due to low number (<5) operators however, SETFIA and Fishwell Consulting (2020) report highest is between December to February.
Sensitivities	SRL species recruitment and growth can vary from year to year depending on environmental changes including water temperature and movement of oceanic currents (Bruce et al. 2007) which impact catch availability. The target species are not a listed species under the EPBC Act.
Existing pressures	The SRL fishery within the Victorian management area is classified as a sustainable stock and not subject to overfishing. COVID-19 has had a significant impact on Australia's fisheries and aquaculture industry. The impact has been complex and resulted from both demand-side disruptions to domestic and international markets and supply-side disruptions from social distancing measures across fishing and aquaculture activities and issues in crewing vessels and sourcing inputs in some sectors (DAWE 2021a). The combined effect of COVID-19 and export limitations resulted in a dramatic beach price reduction from late January 2020 onwards. In response, quota roll-over provisions were s introduced allowing fishers to delay catching some 2019/20 quota until the 2020/21 season. In the Western Zone a total of 18,269.55t was rolled over (VFA 2021).
Overlap with the EMBA	The EMBA overlaps the management area of the rock lobster fishery.
Stakeholder Feedback	Feedback was received during consultation regarding exploration activities effecting lobsters and their habitat (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 339; Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 270, 278-283, 295-300, 309, 318; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 26, 27, 29). ConocoPhillips Australia clarified that the activity presented in the Environment Plan is for short-term, temporary seabed surveys and exploration drilling with no cause-effect pathways identified for impacts to the long-term sustainability of the fishery.

Source: VFA (2022); SETFIA and Fishwell Consulting (2020); VFA 2021; Linnane et al. (2018).

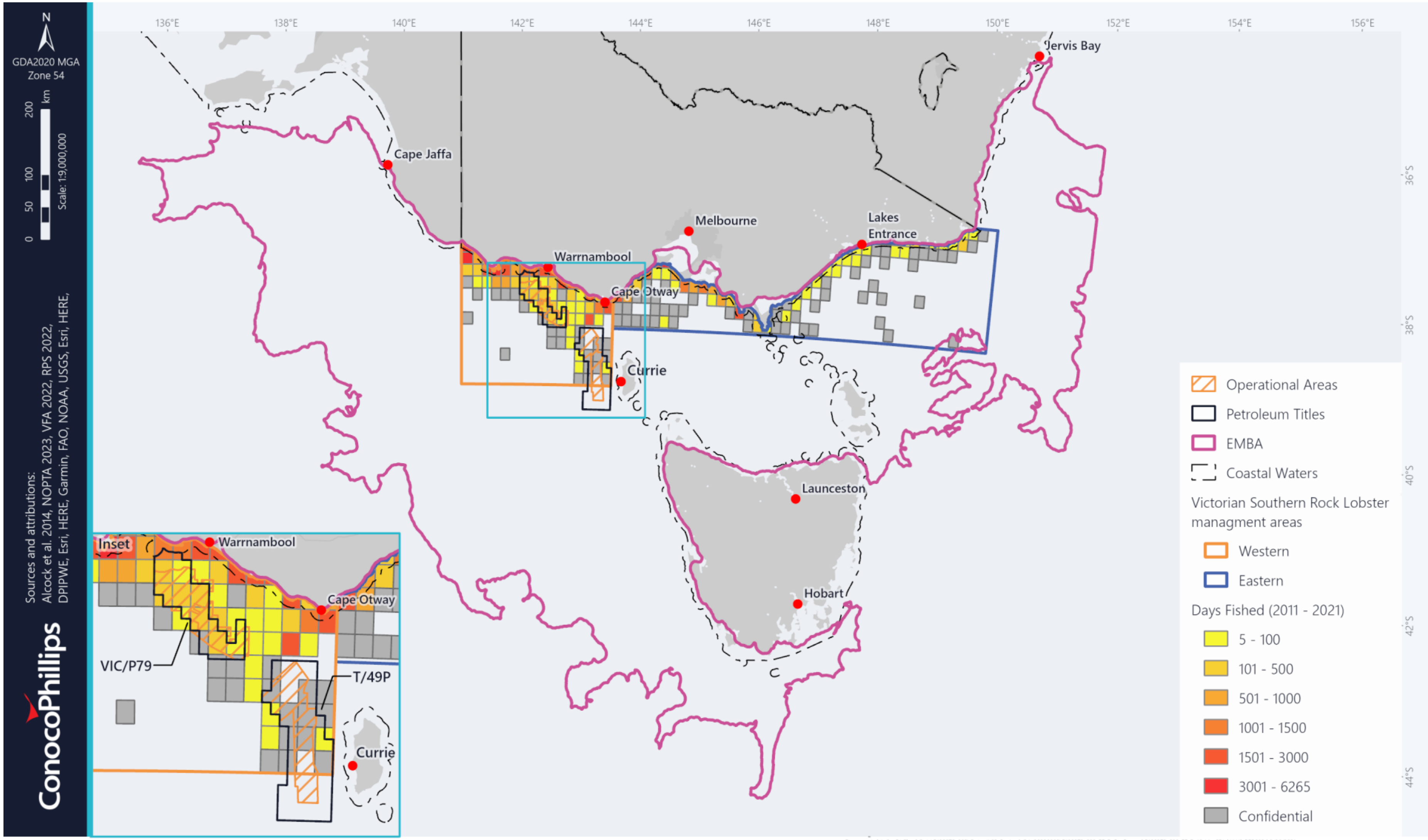


Figure 4-76: Victorian Rock Lobster Fishery within the EMBA

4.7.7.2. Giant Crab Fishery

The Victorian Giant Crab Fishery has the same fishing boundaries as the Victorian Rock Lobster Fishery (Figure 4-77) and targets Giant Crab (*Pseudocarcinus gigas*) using baited lobster pots in depths of 150 – 300 m (SETFIA and Fishwell Consulting 2020). Since the introduction of quota management in the giant crab fishery in 2001, there have been less than 5 dedicated fishers active in the fishery and up to 20 fishers annually reporting giant crab catch as by-product from rock lobster fishing (VFA 2021). Fishery catch statistics for the giant crab fishery are provided in Table 4-31.

Table 4-31: Victorian Giant Crab Fishery

Aspects	Description
Primary landing ports	Portland, Port Fairy, Warrnambool, Port Campbell, Apollo Bay.
Target species	Giant crab (*Pseudocarcinus gigas*)
Fishing season	Fishing closures: 15 September to 15 November: protect males during moult 1 June to 15 November: protect females while breeding and in berry (with eggs attached)
Licences / Active vessels (2019-2020)	Maximum 30 but as of 2020, there were 11 fishery access licenses with <5 active vessels.
Recent catch within fishery	Catches of Giant Crab over the whole fishery for the last five seasons were: 2020: 12.1 t with no assigned value. 2019: 9.8 t with no assigned value. 2018: 10.5 t with no assigned value. 2017: 9.8 t with no assigned value. 2016: 10.0 t with no assigned value.
Overlap with operational area	Data shows that 28 reporting grids overlap the operational areas. However, catch and effort data is not available due to low number (<5) operators.
Catch in operational area	Not available due to due to low number (<5) operators however, SETFIA and Fishwell Consulting (2020) report highest is between December to February.
Sensitivities	Recruitment of the giant crab is not distributed evenly over the fishery with some areas appearing to have higher juvenile abundance than others. This is not a function of habitat but appears to be related to larval drift and thus movement by currents (FRDC 2018). Changes in ocean currents resulting from climate change or upwelling events may affect this process and recruitment.
Existing pressures	The giant crab within the Victorian management area is classified as a sustainable stock and not subject to overfishing. See also Table 4-30 for Victorian SRL.
Overlap with the EMBA	The EMBA overlaps the management area of the giant crab fishery.
Stakeholder Feedback	Feedback was received during consultation regarding exploration activities effecting the life-cycle, biomass and habitat of giant crabs (Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 421, 422, 424). ConocoPhillips Australia clarified that the activity presented in the Environment Plan is for short-term, temporary seabed surveys and exploration drilling with no cause-effect pathways identified for impacts to the long-term sustainability of the sustainable Victorian GC fishery.

Source: VFA (2020); SETFIA and Fishwell Consulting (2020); Hartmann et al. (2018).

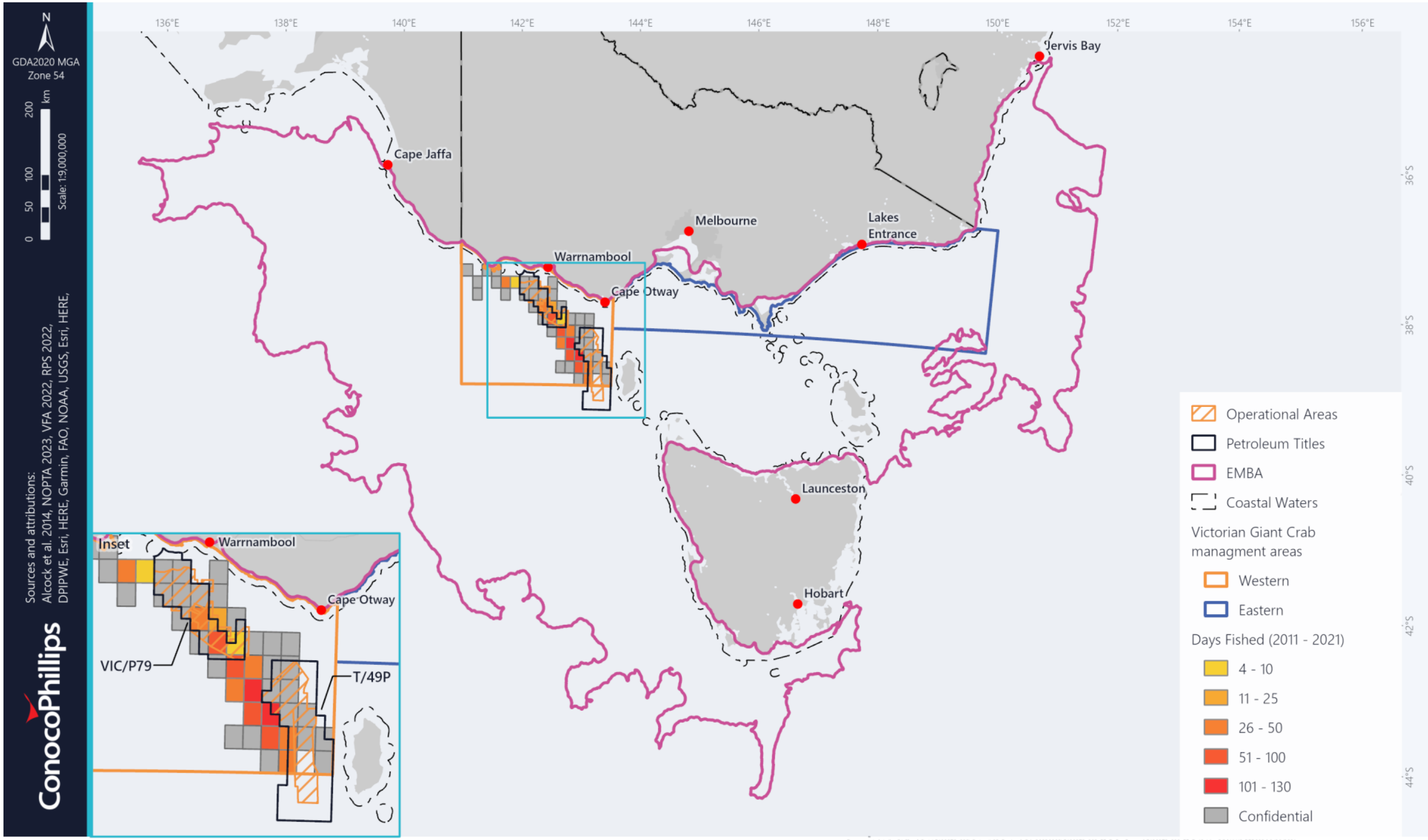


Figure 4-77: Victorian Giant Crab Fishery within the EMBA

4.7.7.3. Abalone Fishery

Abalone diving activity occurs close to shoreline (generally no greater than 30 m depth) using hookah gear (breathing air supplied via hose connected to an air compressor on the vessel) and is split into two stocks (blacklip and greenlip) and three zones, Western, Central and Eastern. Blacklip abalone stocks within the contemporary fishing grounds are fully fished, and greenlip abalone stocks have limited abundance in the Western and Central Zones. The Abalone Fishery is one of Victoria's most valuable commercial fisheries with almost all of the catch exported to international markets, predominately in Asia. Additional detail is provided in Table 4-32. The Victorian abalone fishery zones are shown in Figure 4-79, which was identified during consultation (Org ID: 580, Abalone Council Victoria, Org ID 588, Western Abalone Divers Association, Event ID: 4131, FB ID: 445).

Table 4-32: Victorian Abalone Fishery

Aspects	Description
Primary landing ports	N/A
Target species	Blacklip abalone (*Haliotis rubra*) stock and greenlip abalone (*H. laevigata*) stock (updated to reflect separate stocks identified during consultation (Org ID: 580, Abalone Council Victoria, Org ID 588, Western Abalone Divers Association, Event ID: 4131, FB ID: 444).
Fishing season	12-month season, beginning 1st April
Licences / Active vessels (2021-2022)	14 in the western zone 34 in the central zone 23 in the eastern zone
Recent catch within fishery	2019: 649 t valued at $31.3 million 2018: 756 t valued at $26.9 million 2017: 721 t valued at $20.49 million 2016: 725 t valued at $19.8 million
Catch in operational area	No known catch recorded
Harvest Strategy	Quotas are managed, with total allowable commercial catch (TACC) set annually based on stock assessments. TACCs for the 2022/23 quota season reflect the relative abundance of each species: Eastern Zone – 331 tonnes blacklip Central Zone – 240.8 tonnes blacklip, 3.4 tonnes greenlip Western Zone – 33.8 tonnes blacklip, 1.9 tonnes greenlip
Sensitivities	The target species are not listed species under the EPBC Act.
Existing Pressures	The central and eastern stock associated with the abalone fishery within the Victorian management area is classified as depleting. The western stock associated with the abalone fishery within the Victorian management area is classified as sustainable.
Overlap with the EMBA	The EMBA overlaps the management area of the abalone fishery.
Stakeholder Feedback	During consultation it was identified that Victorian stocks are at risk of a herpes-like virus that tends to reappear when abalone are under stress (Org ID: 580, Abalone Council Victoria, Org ID 588, Western Abalone Divers Association, Event ID: 4131, FB ID: 446).

Source: SETFIA and Fishwell Consulting (2020); VFA (2022); Mundy et al. (2021); ACA (2023)

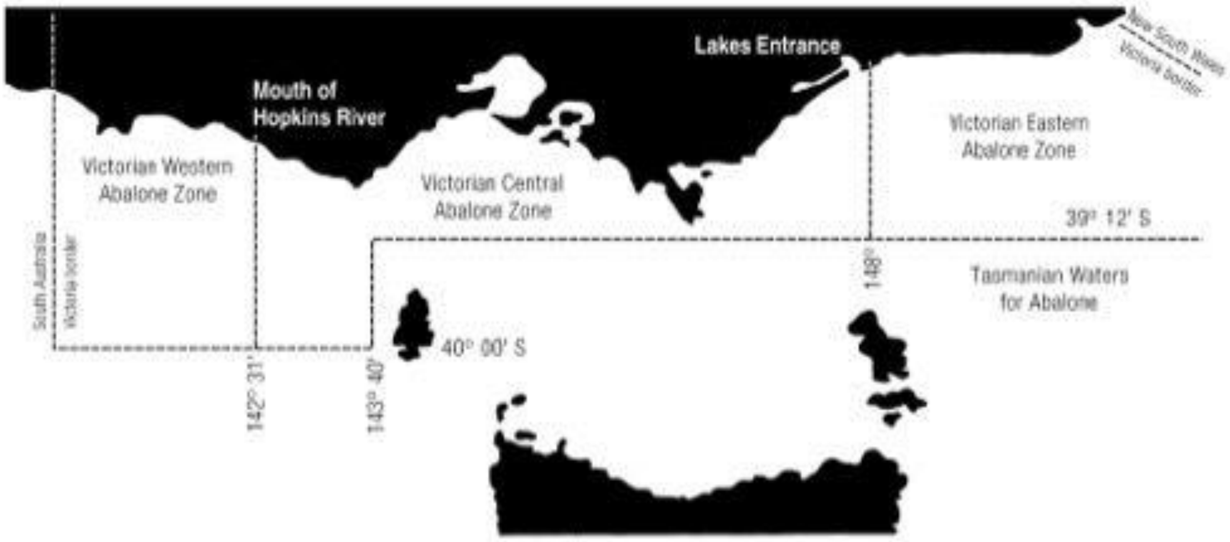


Figure 4-78: Victorian Abalone Fishery zones

4.7.7.4. Bays and Inlet Fisheries

Victorian bay, inlet and estuarine finfish fisheries are multi-species, multi-method fisheries that are subject to competing uses and characterised by fluctuations in fish abundance. The larger bay and inlet fisheries include Western Port, Port Phillip Bay, Corner Inlet/Nooramunga and the Gippsland Lakes. Commercial netting was phased out in Western Port in 2009, in Gippsland Lakes in 2020, and in Port Philip Bay in 2022 (VFA 2022c). There are 8 active fishing licences between Western Port and Port Phillip Bay, 18 in Corner Inlet/Nooramunga and Gippsland Lakes is not reported (VFA 2022c). There are a range of management controls including limited entry, gear limits and restrictions, closures, size limits, catch limits due to the variety of species targeted.

There is overlap between the EMBA and the management area of the Bays and Inlets fisheries.

4.7.7.5. Eel Fishery

Initially the commercial eel fishery was based on supplying bait for rock lobster and long-line shark fisheries. The export of frozen short-finned eels to Europe only commenced in the early-mid 1960s. Target species spend the majority of their life cycle in fresh water or estuaries but travel to the ocean to spawn once before dying (VFA 2022c). The eel fishery is considered an inland fishery by the VFA. However, it is assessed in the EP due to the species lifecycle characteristic which expose them to the marine environment and the level of concern about eels, their use and abundance, with this species showing the connections between people, the coastline and the open ocean as eels migrate (NOO 2002b). Additional detail on this species is provided in section 4.6.5.2 (Eels), with additional details on the fishery provided in Table 4-33. [Paragraph updated in response to Matter: F10].

Table 4-33: Victorian Eel Fishery

Aspects	Description
Primary landing ports	N/A
Target species	Short-finned eel (*Anguilla australis*) and long-finned eel (*Anguilla reinhardti*)
Fishing season	Unknown
Licences / Active vessels (2021-2022)	18
Recent catch within fishery*	2019: 49.57 t with no assigned value. 2018: 54.97 t with no assigned value. 2017: 83.60 t with no assigned value. 2016: 35.74 t with no assigned value.

Harvest Strategy	The fishery is quota managed, with a total allowable commercial catch set annually based on the outcomes of a stock assessment process.
Sensitivities	The target species are not a listed species under the EPBC Act.
Existing Pressures	Both the short-finned and long-finned eel within the Victorian management area are classified as sustainable stock.
Overlap with the EMBA	The EMBA overlaps the mouths of the majority of coastal river basins and estuaries. However, the species likely spawn in the Coral Sea outside of the EMBAs and are targeted in inland river systems.
Stakeholder Feedback	No feedback specific to the eel fishery was received during consultation.

Source: VFA (2022); Bartleet et al. (2021); Hall et al. (2021).

* Reported recent catch is only representative of the short-finned eel as there is no reported catch for the long-finned eel available post 2014

4.7.7.6. Pipi Fishery

Pipi is the common name given to the small bivalve, *Donax deltoides*, which is found on high-energy sandy beaches in the intertidal zone. Pipi have naturally large spatial and temporal variations in recruitment, settlement and distribution, influenced by environmental factors. Pipi are found from the Eyre Peninsula to Kingston in South Australia, through Tasmania and Victoria, to Fraser Island in south-eastern Queensland (Figure 4-79) (VFA 2022c). The new pipi fishery commenced in April 2020. Additional detail is provided in Table 4-34.

Table 4-34: Victorian Pipis Fishery

Aspects	Description
Primary landing ports	N/A
Target species	Pipi (*Donax deltoids*)
Fishing season	Year-round
Licences / Active vessels (2019-2020)	Other than 3 specialised bait fisheries only Ocean Fishery Access licence holders are permitted to harvest pipis.
Recent catch within fishery	2021: 45.8 t with no assigned value. 2020: 27.57 t with no assigned value. 2019: 53.92 t with no assigned value. 2018: 47.46 t with no assigned value. 2017: 35.55 t with no assigned value. 2016: 51.09 t with no assigned value.
Harvest Strategy	The fishery has an ongoing quota management regime and has set a total allowable commercial catch. Further management regulations include a size limit, gear restrictions and labelling requirements.
Sensitivities	The target species are not a listed species under the EPBC Act.
Existing Pressures	Stock within the Victorian management area is classified as undefined.
Overlap with the EMBA	The EMBA overlaps the commercial management zones which are located in Discovery Bay (Western and Eastern) and Venus Bay.
Stakeholder Feedback	No feedback specific to the pipis fishery was received during consultation.

Source: VFA (2022); SETFIA and Fishwell Consulting (2020); Ferguson and Daniel (2021).

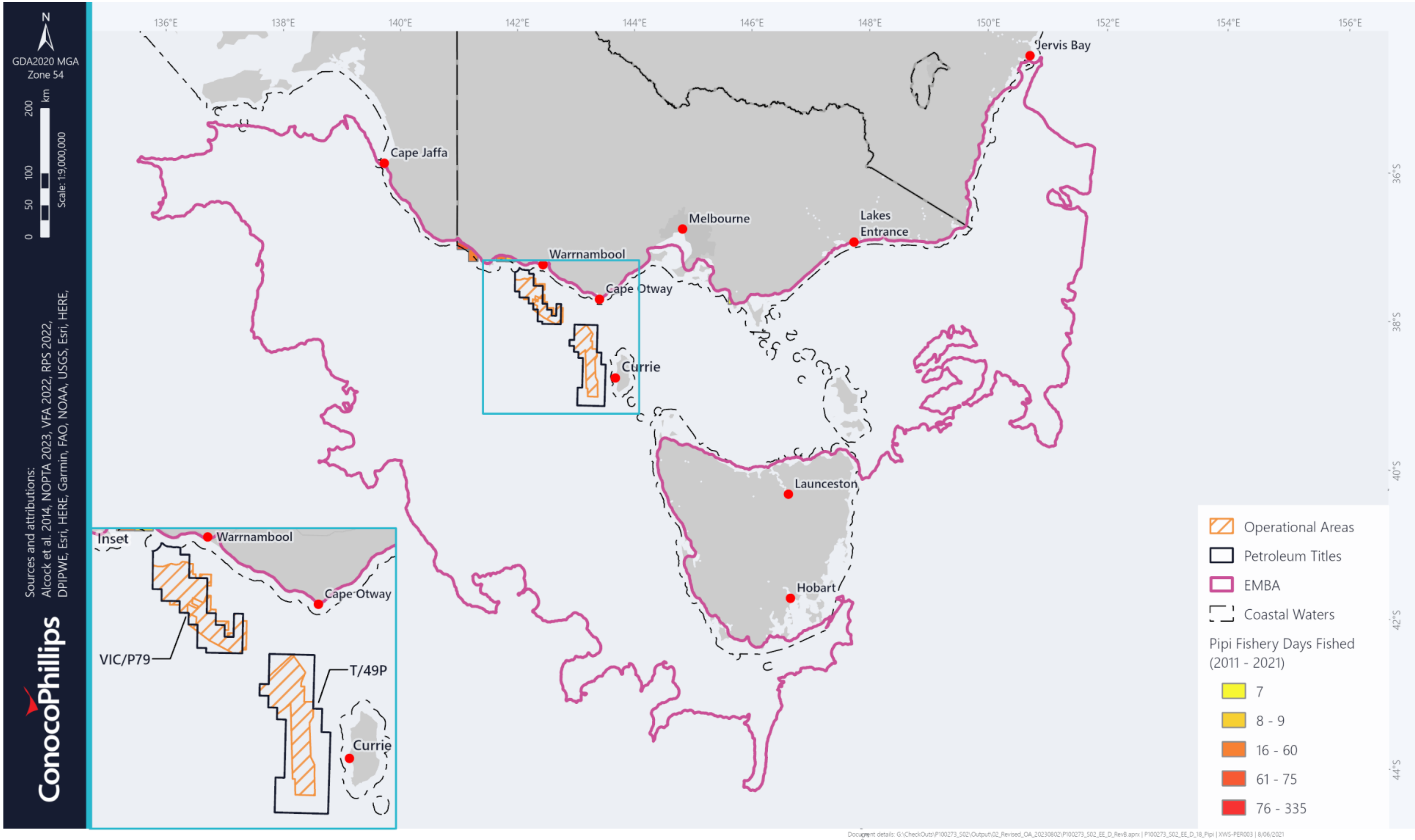


Figure 4-79: Victorian Pipi Fishery within the EMBA

4.7.7.7. Multi-species Ocean Fishery

The multi-species ocean fishery is comprised of three relevant sub-sectors; Ocean fishery, Commercial permit fishery and the Octopus fishery (central and western zone). The primary target of these fisheries is typically the pale octopus (*Octopus pallidus*); however, Maori octopus (*Macroctopus maorum*), gloomy octopus (*Octopus tetricus*) and a variety of other species may also be taken. The fishery is open year-round and allows for the use of a variety of methods. Historically the Octopus (eastern zone) fishery was included in this fishery; however, in August 2020 it was established as a standalone fishery. Further, the Commercial permit fishery is used to provide permits to undertake activities that would otherwise contravene fisheries rules which are usually used for one-off instances or specific purposes. Limited data is available for the fishery due to confidentiality concerns as there are less than 5 active fishers.

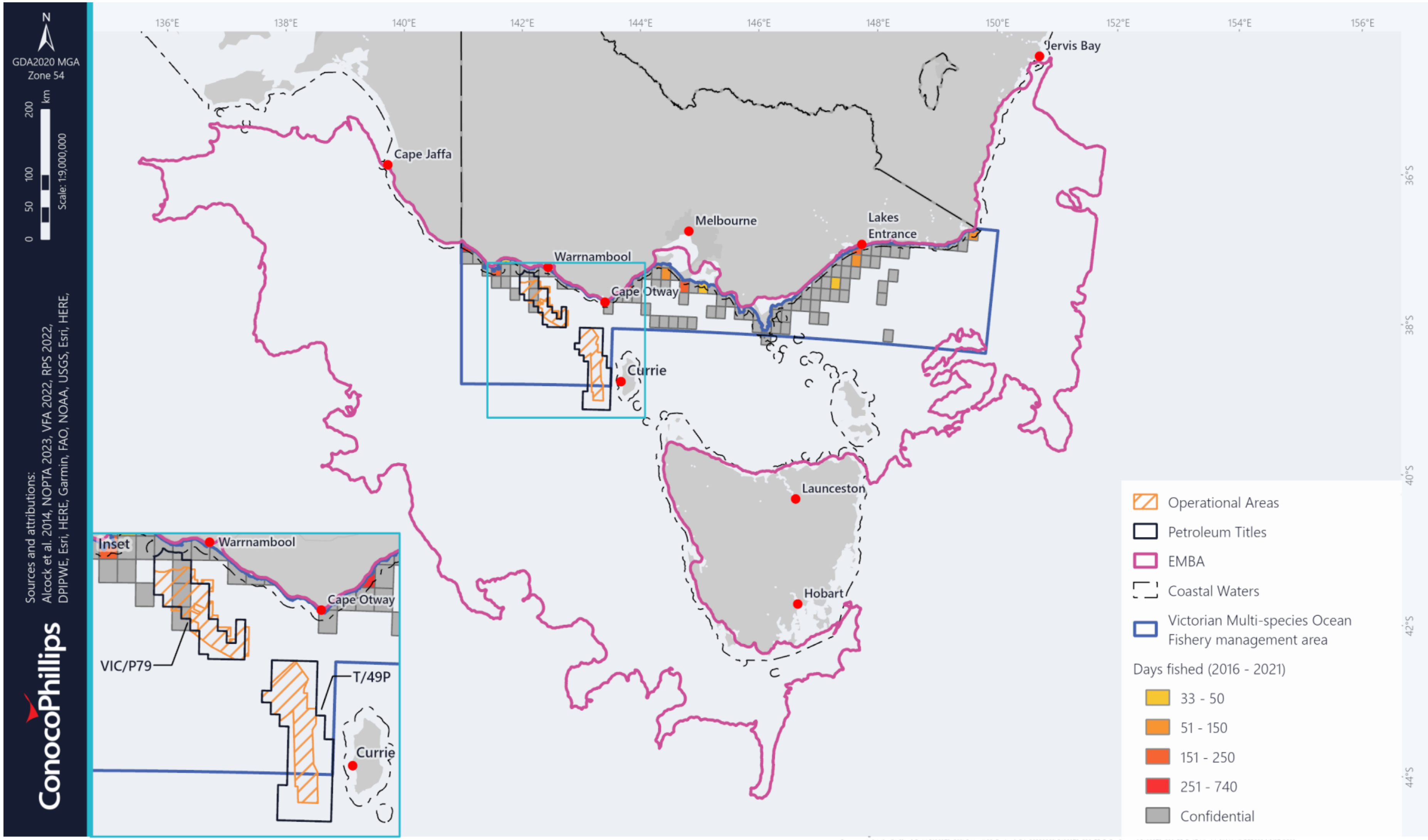


Figure 4-80: Victorian Multi-species Ocean fishery within the EMBA

4.7.7.8. Octopus Fishery

There are three zones have been established for the management of commercial octopus fishing in Victoria (Figure 4-81). The target species, pale octopus (*Octopus pallidus*), are found in bays and coastal waters in Victoria, South Australia, Tasmania and less commonly southern New South Wales. Their main habitat is sandy substrates, often near beds of sponges or sea squirts. The new octopus fishery commenced in August 2020. Additional detail is provided in Table 4-35.

Table 4-35: Victorian Octopus Fishery

Aspects	Description
Primary landing ports	Victorian ports
Target species	Target species is pale octopus (*Octopus pallidus*)
Fishing season	Year-round.
Licences / Active vessels (2021-2022)	Octopus Fishery Access Licences authorise commercial take of octopus from the eastern octopus zone (11 licences). Only exploratory or temporary permits are granted in the central and western zone.
Recent catch within fishery	2021: 115.35 t with no assigned value. 2020: 50.35 t with no assigned value. 2019: 88.60 t with no assigned value. 2018: 41.02 t with no assigned value. 2017: 25.69 t with no assigned value. 2016: 15.98 t with no assigned value.
Catch in operational area	Data shows that 2 reporting grids overlap the northern extent of the VICP/79 operational areas. However, catch and effort data is not available due to low number (<5) operators.
Harvest Strategy	The fishery sets a total allowable commercial catch and value for each quota unit each year. Further management regulations include a limit to the number of lines of octopus pots as well as the number of octopus pots themselves.
Sensitivities	The target species are not a listed species under the EPBC Act.
Existing Pressures	Stock within the Victorian management area is classified as undefined.
Overlap with the EMBA	The EMBA overlaps the commercial management zone.
Stakeholder Feedback	No feedback specific to the octopus fishery was received during consultation.

Source: VFA (2022); Krueck et al. (2021).

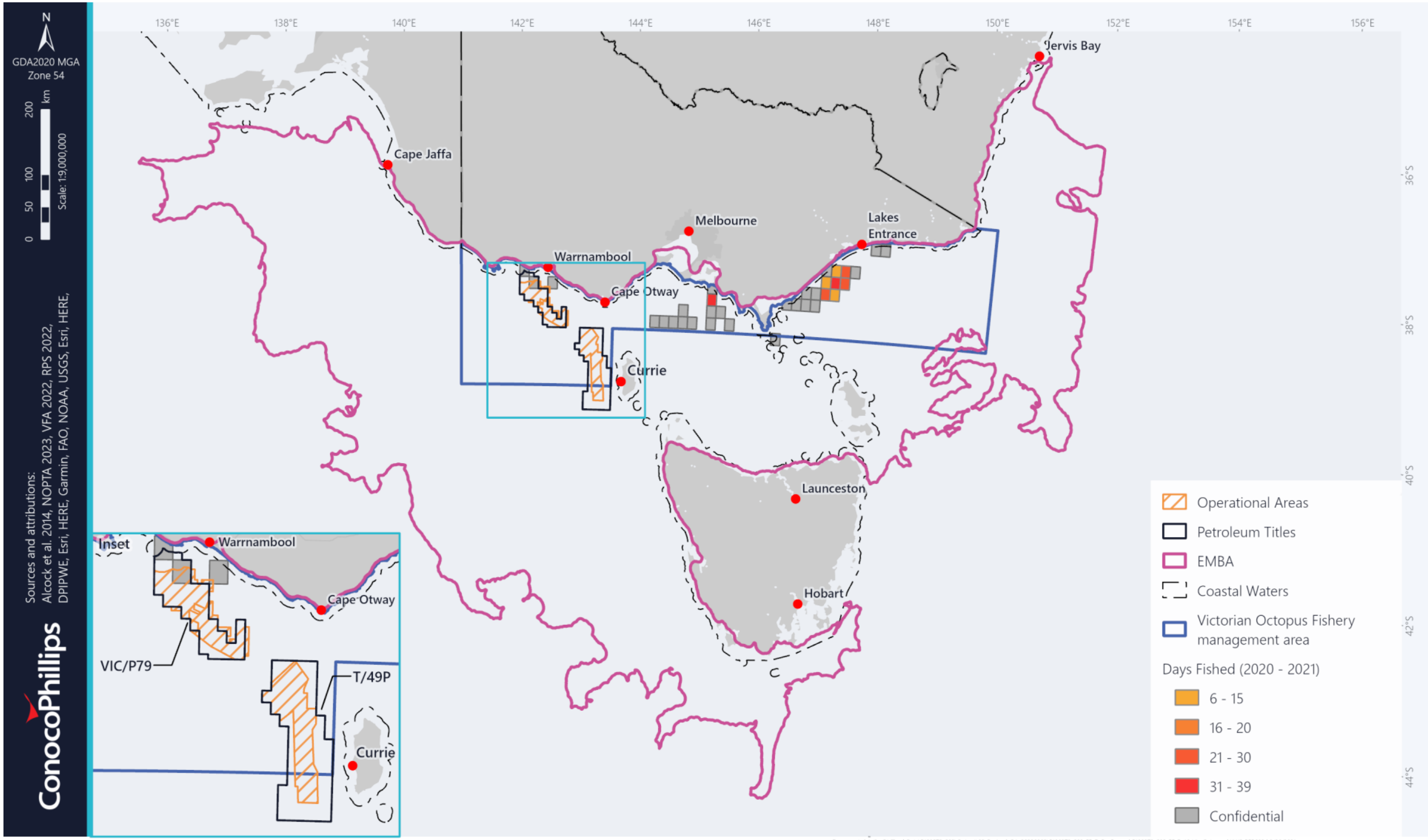


Figure 4-81: Victorian Octopus fishery within the EMBA

4.7.7.9. Scallop Fishery

Commercial fishing for scallops has been part of the Victorian fishing industry since the early 1970's. In 1986, management of the Bass Strait Scallop Fishery was split between the Commonwealth, Tasmania and Victoria under an Offshore Constitutional Settlement (OCS). Through the OCS, three zones emerged: The Commonwealth central zone, a Victorian zone and a Tasmanian zone. Landing data records for these zones has been absent since 2013 with records not found until 2021.

The waters of the Victorian zone extend out to 20 nm from the high tide water mark but exclude the bays and inlets along the coast where commercial fishing for scallops is prohibited (Figure 4-82). Towed scallop dredges (typically 4.5 m wide) that target dense aggregations ('beds') of scallop. A tooth-bar on the bottom of the mouth of the dredge lifts scallops from the seabed and into the dredge basket.

The fishery is characterised by highly variable catches due to severe fluctuations in the resource. In some years, there are so few scallops that fishing cannot take place as it would put undue pressure on stocks and threaten the long-term survival of the stock and fishery (VFA 2022c). While scallops are still present in the region, they are believed to be present in much lower numbers than historically. Fishing activity in the fishery is currently low, although the VFA is implementing management arrangements designed to increase activity across the fishery. Currently there is a total allowable catch of 135t and typically only results in a small portion being harvested each year. However, more recently in 2020–2021 there have been improved catches (Semmens and Woodhams 2021). Additional detail is provided in Table 4-36.

Table 4-36: Victorian Scallop Fishery

Aspects	Description
Primary landing ports	Vessels are typically based out of Lakes Entrance or Port Welshpool, although licence holders may fish the entire coastline.
Target species	Commercial Scallop (*Pecten fumatus*)
Fishing season	12 month season, beginning 1st April. Fishing usually occurs during the winter months but can occur from April to the end of November.
Licences / Active vessels (2021-2022)	91 licences. Approximately 10-15 boats operating in the fishery.
Recent catch within fishery	2021: 638.3 t with no assigned value. 2013 -2020: Insufficient data to report because as less than five license holders (policy requirement to protect commercial confidentiality of data)
Catch in operational area	No known catch recorded
Harvest Strategy	The fishery sets a total allowable commercial catch and value for each quota unit each year. Further management regulations include a legal minimum length, gear restrictions, and mandatory vessel monitoring systems on all vessels.
Sensitivities	The target species are not a listed species under the EPBC Act.
Existing Pressures	Stock within the Victorian management area is classified as depleted. Scallops have highly variable levels of natural mortality, with an historical 'boom' or 'bust' nature which impacts catch availability.
Overlap with the EMBA	The EMBA overlaps with the fishery management area. The highest fishing effort is concentrated in the eastern waters of the state.
Stakeholder Feedback	No feedback specific to the scallop fishery was received during consultation.

Source: VFA (2022); SETFIA and Fishwell Consulting (2020); Semmens and Woodhams (2021); (personal communication, 27 October 2022).

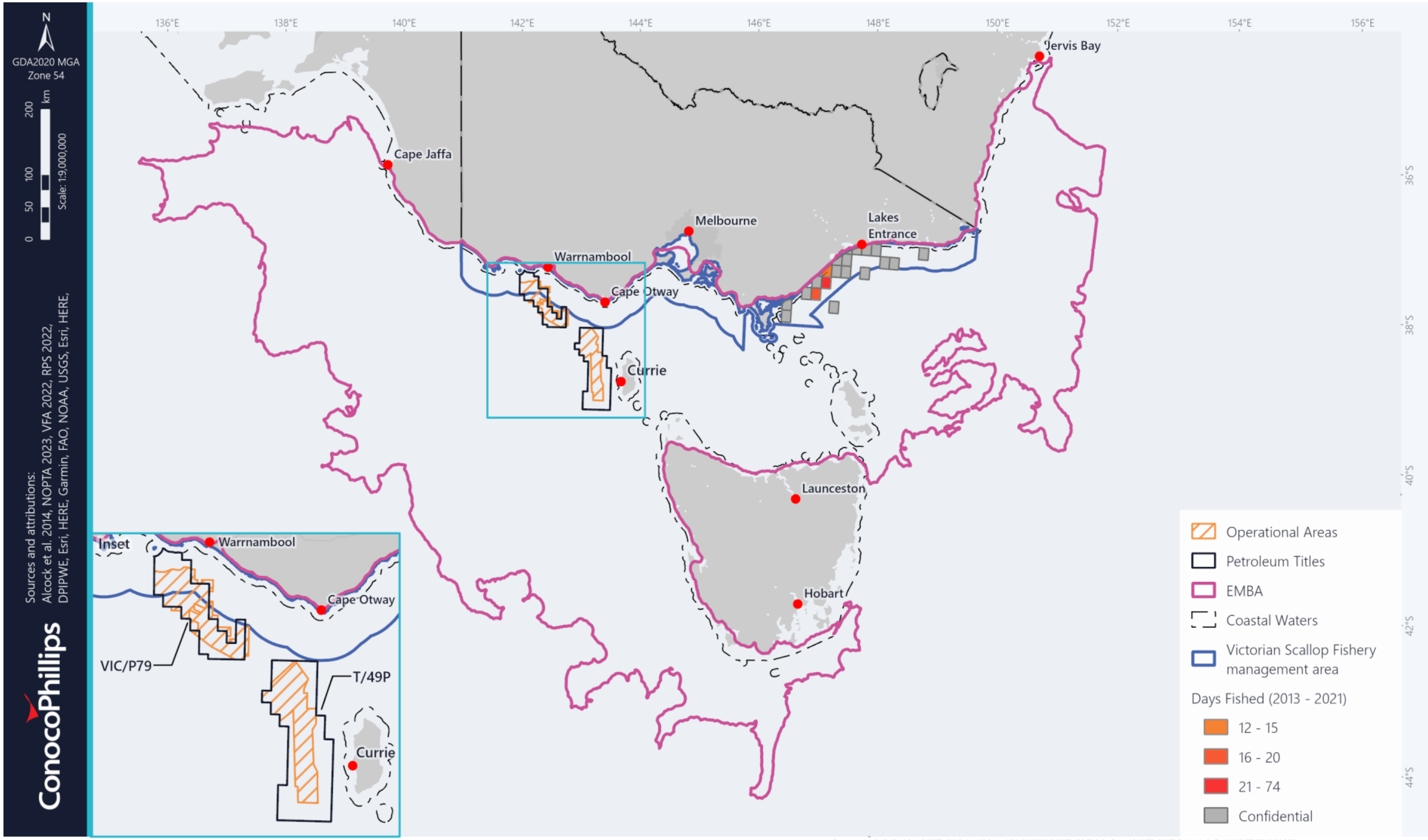


Figure 4-82: Victorian Scallop Fishery within the EMBA

4.7.7.10. The Scallop Dive (Port Phillip Bay) Fishery

The Scallop Dive (Port Phillip Bay) Fishery was established in 2013 following the public auction of a single commercial fishery access licence. The only species that can be harvested under the Scallop Dive (Port Phillip Bay) Fishery Access Licence are the commercial scallop (*Pecten fumatus*) and the doughboy scallop (*Mimachlamys asperrima*), both of which must be harvested by hand. Due to the size of the fishery there is insufficient data to report as there are less than five licence holders (policy requirement to protect commercial confidentiality of data). The key species, commercial scallop, are not listed under the EPBC Act and the stock within the Port Phillip Bay Dive scallop fishery is classified as sustainable (Semmens and Woodhams 2021).

There is overlap between the EMBA and the management area of the scallop dive (Port Phillip Bay) fishery.

4.7.7.11. Sea Urchin Fishery

Over the last several decades the long-spined sea urchin (*Centrostephanus rodgersii*), has undergone a range extension to Victoria and Tasmania from NSW due to the extension of the warm East Australia Current. The sea urchin fishery has been operating as a 'developing fishery' under permits since 1998. There are 4 management zones where commercial sea urchin divers can fish in Victoria. Recently the Port Phillip Bay zone and the Eastern zone have been allocated a total allowable catch to better manage stock status and ensure long term sustainability. Additional detail is provided in Table 4-37.

Table 4-37: Victorian Sea Urchin Fishery

Aspects	Description
Primary landing ports	Victorian ports
Target species	White sea urchin (*Heliocidaris erythrogramma*) and black, long-spined sea urchin (*Centrostephanus rodgersii*)
Fishing season	Year-round.
Licences / Active vessels (2021-2022)	17 active licences.
Recent catch within fishery	2021: 94.3 t with no assigned value. 2020: 107.02 t with no assigned value. 2019: 112.68 t with no assigned value. 2018: 66.88 t with no assigned value. 2017: 61.15 t with no assigned value. 2016: 30.1 t with no assigned value.
Catch in operational area	No known catch recorded
Harvest Strategy	The fishery is managed under a conservative total allowable commercial catch and divers are only allowed to collect sea urchins by hand. Further there is a minimum quota holding equivalent of 20t per licence.
Sensitivities	The target species are not a listed species under the EPBC Act.
Existing Pressures	Stock within the Victorian management area is classified as sustainable.
Overlap with the EMBA	The EMBA overlaps all four fishing zones, however only Port Phillip Bay Zone and the Eastern Zone have management plans.
Stakeholder Feedback	No feedback specific to the sea urchin fishery was received during consultation.

Source: VFA (2022); Cresswell et al. (2021).

4.7.7.12. Wrasse (Ocean) Fishery

The Victorian Wrasse (Ocean) Fishery was established in the 1990s when a domestic market based on live trade to restaurants and seafood outlets was created. The fishery extends along the entire length of the Victorian coastline and out to 20 nautical miles offshore, except for marine reserves. The fishery is divided into 3 commercial management zones; licence holders can fish in any of these zones (Figure 4-83). Most wrasse is harvested by hook and line although commercial rock lobster fishers who also hold a commercial wrasse licences can keep those fish that they catch in their rock lobster pots. The preferred water depths for blue-throat wrasse range from 20 to 40 m, while saddled wrasse prefer depths of 10 to 30 m. Additional detail is provided in Table 4-38.

Table 4-38: Victorian Wrasse Fishery

Aspects	Description
Primary landing ports	Various
Target species	Blue-throat wrasse (*Notolabrus tetricus*), saddled wrasse (*N. fucicola*), orange-spotted wrasse (*N. parilus*).
Fishing season	Year-round.
Licences / Active vessels (2021-2022)	22 access licences.
Recent catch within fishery	2021: 22 t with no assigned value. 2020: 20 t with no assigned value. 2019: 28 t with no assigned value. 2018: 33 t valued at $672,000 2017: 38 t valued at $767,000 2016: 24 t valued at $557,000
Catch in operational area	No known catch recorded
Harvest Strategy	The fishery is managed primarily by a legal minimum size and gear restrictions.
Sensitivities	The target species are not a listed species under the EPBC Act.
Existing Pressures	Stock within the Victorian management area is classified as sustainable.
Overlap with the EMBA	The EMBA overlaps the commercial management zones. In recent years, catches have been highest of the central coast (Port Phillip Heads, Western Port and Wilson's Promontory) and the west coast.
Stakeholder Feedback	No feedback specific to the wrasse fishery was received during consultation.

Source: VFA (2022), SETFIA and Fishwell Consulting (2020); Krueck et al. (2021b).

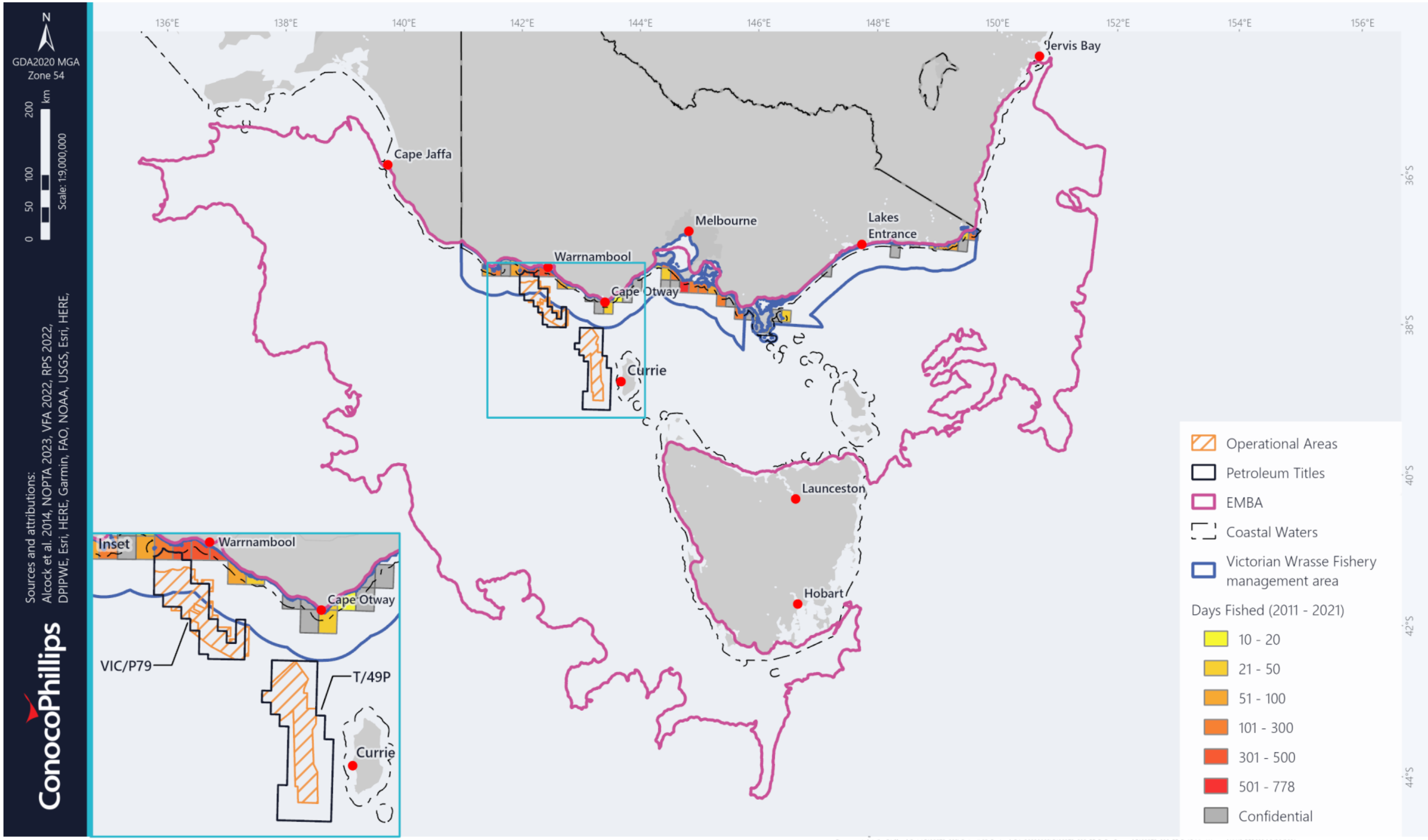


Figure 4-83: Victorian Wrasse Fishery and within the EMBA

4.7.8. Tasmanian Managed Fisheries

Tasmanian state fisheries are managed by the Department of Natural Resources and Environment Tasmania (NRE Tas) under the *Living Marine Resources Management Act 1995*. NRE Tas jurisdiction covers all waters that are within the limits of the state with additional offshore constitutional settlements for specific fisheries beyond state boundaries into Commonwealth waters. Tasmanian-managed commercial fisheries with access licences that authorise harvest in the EMBA are detailed within Table 4-39. Though certain fisheries possess jurisdiction to fish within the EMBA, analysis of publicly available and requested catch data indicates that not all fisheries have recently actively fished within the operational area and/or the EMBA.

Table 4-39: Tasmanian state managed fisheries within the EMBA

Tasmanian-managed Fisheries	Active Fishing within the EMBAs in the last 10 years
Abalone fishery	✓
Commercial Dive fishery	✓
Giant Crab fishery	✓
Octopus fishery	✓
Scalefish fishery	✓
Scallop fishery	X
Marine Plant fishery	✓
Shellfish fishery	X
Southern Rock Lobster	✓

During consultation, ConocoPhillips Australia was advised that fishing intensity data represents only one measure of stock status/abundance and is not indicative of unfished stock which is important for recruitment into the fishery (Document ID: 3923). This assessment has utilised the most recently updated government data of fishery stocks and sustainability statuses to inform the assessment process. Furthermore, thorough consequence evaluation of all potential impacts and risks to unfished stock (i.e. fish as ecological receptors) from the activity has been assessed within relevant sections to ensure impacts do not cause impacts at a population level. See sections 6.6, 6.7, 7.4, 7.6, and 7.7 for further details.

4.7.8.1. Rock Lobster Fishery

The Tasmanian Rock Lobster Fishery operates in State and Commonwealth waters surrounding Tasmania (Figure 4-84). Since 1986, the Tasmanian Government has had jurisdiction of the fishery in waters south of 39° 12’, and out to 200 nautical miles from the coastline by way of an Offshore Constitutional Settlement with the Commonwealth Government. The fishery primarily targets the Southern rock lobster (SRL) (*Jasus edwardsii*) using baited lobster pots (SETFIA and Fishwell Consulting 2018). Most of the catch comes from 0 – 40 m water depths on coastal reefs. However, some catch is taken as deep as 200 m (SETFIA and Fishwell Consulting 2018). IMAS conducted a review of SRL population characteristics within the Zeehan Marine Park Region in 2022-23. Surveys of commercial fishers operating in and around the ZMP, as well as analysis of commercial rock lobster catch data in the region, identified that most of the fishing reported occurred in waters closer to King Island than the marine park offshore. Surveys also identified that the aggregate catches recorded in fishery reporting blocks overlapping the ZMP were low relative to other areas, implying an overall low population density within the park. A review of catch data showed that catch in tonnes appears to have remained steady since 2008 for both the Tasmanian and Victorian fishing blocks. Fisheries catch statistics for this sector are provided in Table 4-40.

Table 4-40: Tasmanian Southern Rock Lobster Fishery

Aspects	Description
Primary landing ports	North-west Tasmania: Currie Harbour, Grassie Harbour, Smithton, Stanley, Strahan, Wynyard.

Target species	Southern rock lobster (*Jasus edwardsii*)
Fishing season (2022 – 2023)	Fishing Season: • Males – closed 1 October to 15 November for all state waters (except for September closed region which is outside of operational area) to protect males during moulting period. • Females – closed 1 May to 15 November (except for East Coast stock rebuilding zone which is outside of operational area to protect females in berry (with eggs attached).
Licences / Active vessels (2020-2021)	164 licenced vessels in 2020/21. With <5 operating within the operational area.
Recent catch within fishery	Catches of the Rock Lobster commercial fishery for the last five seasons for the whole fishery (subject to available data) were: 2021: 1038 t with no assigned value. 2020: 990 t with no assigned value. 2019: 962 t with no assigned value. 2018: 1,050 t with no assigned value. 2017: 1,050 t with no assigned value.
Overlap with operational area	Data shows that 17 reporting grids overlap the T/49P operational area. However, catch and effort data is not available due to low number (<5) operators.
Catch in operational area	Not available due to confidentiality, however SETFIA and Fishwell Consulting (2020) report that catches across the entire fishery are highest during December to April.
Sensitivities	SRL species recruitment and growth can vary from year to year depending on environmental changes including water temperature and movement of oceanic currents (Bruce et al. 2007) which impact catch availability. The target species are not a listed species under the EPBC Act.
Existing pressures	The SRL fishery within the Tasmanian management area is classified as a sustainable stock and not subject to overfishing.
Overlap with the EMBA	The EMBA overlaps 6 of the 8 Tasmanian commercial fishery assessment areas.
Stakeholder Feedback	Feedback was received during consultation regarding exploration activities effecting lobsters and their habitat with lobster fishing identified as an important part of the King Island economy (Document ID: 3923; Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 339; Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 270, 278-283, 295-300, 309, 318; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 26, 27, 29). ConocoPhillips Australia clarified that the activity presented in the Environment Plan is for short-term, temporary seabed surveys and exploration drilling with no cause-effect pathways identified for impacts to the long-term sustainability of the fishery.

Sources: DNRET (2022a); IMAS (2022a); SETFIA and Fishwell Consulting (2020); Linnane et al. (2021).

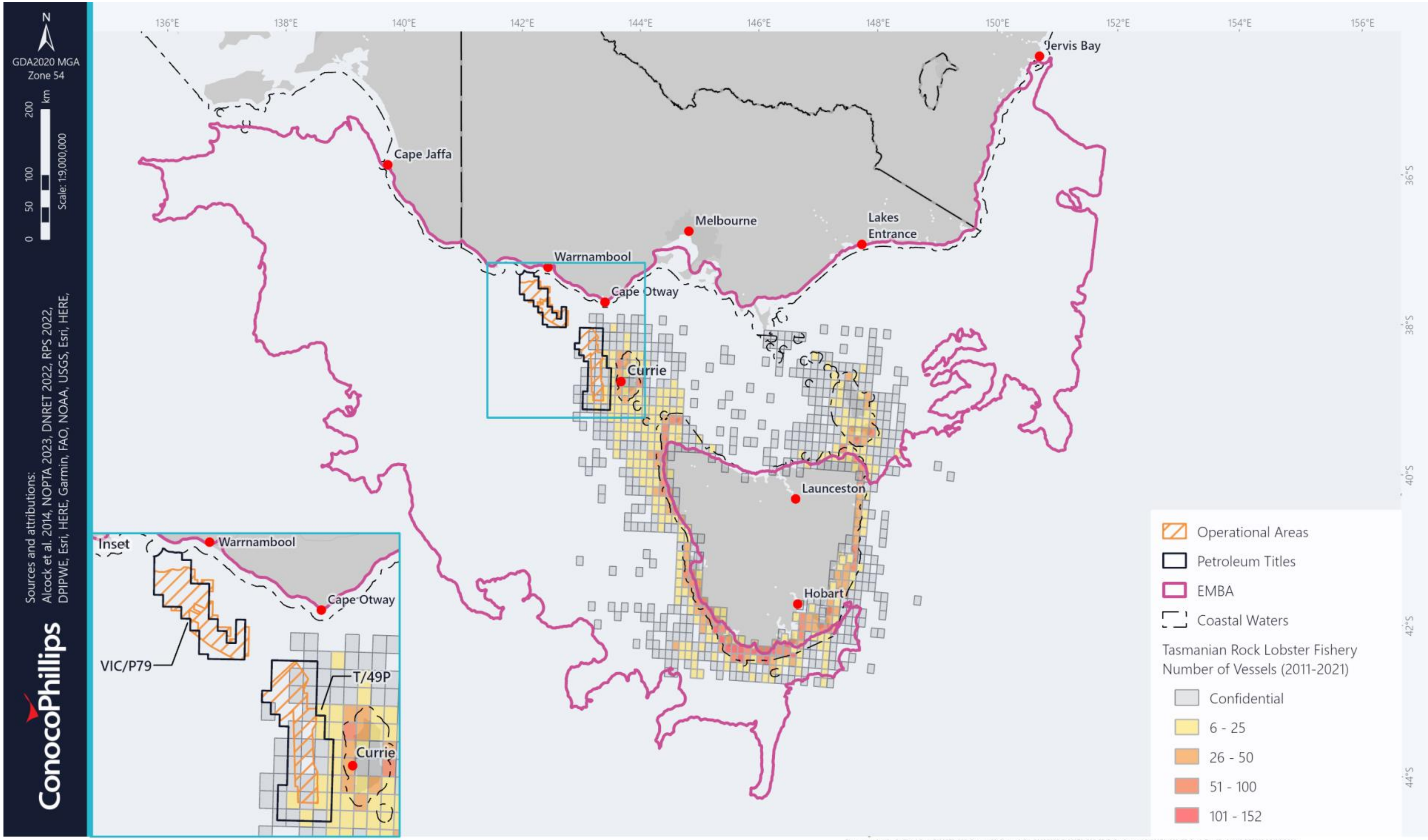


Figure 4-84: Tasmanian Rock Lobster Fishery within the EMBA

4.7.8.2. Giant Crab Fishery

The Tasmanian Giant Crab Fishery operates in State and Commonwealth waters surrounding Tasmania in waters south of 39° 12’, and out to 200 nautical miles from the coastline. The Tasmanian Giant Crab Fishery has the same fishing management boundaries as the Tasmanian Rock Lobster Fishery (Figure 4-85). Most fishing takes place on the edge of the continental slope using baited steel traps (SETFIA and Fishwell Consulting 2018). The Tasmanian Giant Crab fishery is a comparatively small fishery with the annual harvest set at 20.7 tonnes but with a high landed value of approximately $2 million (DNRET 2022b). Fishery catch statistics for this sector are provided in Table 4-41.

Table 4-41: Tasmanian Giant Crab Fishery

Aspects	Description
Primary landing ports	North-west Tasmania: Currie Harbour, Grassie Harbour, Smithton, Stanley, Strahan, Wynyard.
Target species	Giant crab (*Pseudocarcinus gigas*)
Fishing season	Fishing Season: • Males – Open year-round • Females - Fishing closure from 1 June to 15 November to protect females while breeding and in berry (with eggs attached)
Licences / Active vessels	From DPIPWE (2014): For 2013/2014 a total of 84 licences were issued with some fishers holding more than one giant crab licence. The fishery is linked to the Tasmanian Rock Lobster Fishery through the requirement to hold a rock lobster licence as well as a giant crab licence to target giant crab. 17 vessels reported a catch of giant crab during the 2013/2014 season of which eight recorded catch of greater than 1 t.
Recent catch within fishery	Catches for the last five seasons for the whole fishery were: 2019: 18.5 t with no assigned value. 2018: 19.48 t with no assigned value. 2017: 17.82 t with no assigned value. 2016: 29.57 t with no assigned value. 2015: 19.9 t with no assigned value.
Overlap with operational area	Data shows that 10 reporting grids overlap the T/49P operational area. However, catch and effort data is not available due to low number (<5) operators.
Catch in Operational Area	Not available due to confidentiality. However, SETFIA and Fishwell Consulting (2020) reports that catches across the entire fishery are highest during January to March.
Sensitivities	Recruitment of the giant crab is not distributed evenly over the fishery with some areas appearing to have higher juvenile abundance than others. This is not a function of habitat but appears to be related to larval drift and thus movement by currents (FRDC 2018). Changes in ocean currents resulting from climate change or upwelling events may affect this process and recruitment.
Existing pressures	The Status of Australian Fish Stocks classifies the Tasmanian giant crab stock as depleted. DPIPWE have implemented reductions in TAC since 2006 in response to declining catch rates. Lack of appropriate biological data of the stock in the fishery and the unknown extent to which trawling activities impact on giant crab stock and the species natural habitat, are the main factors limiting the understanding of the declining catch rate trend (DoEE 2019b).
Overlap with the EMBA	The EMBA overlaps 6 of the 8 Tasmanian commercial fishery assessment areas.
Stakeholder Feedback	Feedback was received during consultation regarding exploration activities effecting the life-cycle, biomass and habitat of giant crabs (Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 421, 422, 424). ConocoPhillips Australia clarified that the activity presented in the Environment Plan is for short-term, temporary seabed surveys and exploration drilling with no cause-effect pathways identified for impacts to the long-term sustainability of the depleted Tasmanian GC fishery, noting that the operational area does not overlap areas of reportable vessel operation (>5 boats) for this fishery.

Sources: DNRET (2022a); IMAS (2022b); SETFIA and Fishwell Consulting (2020).

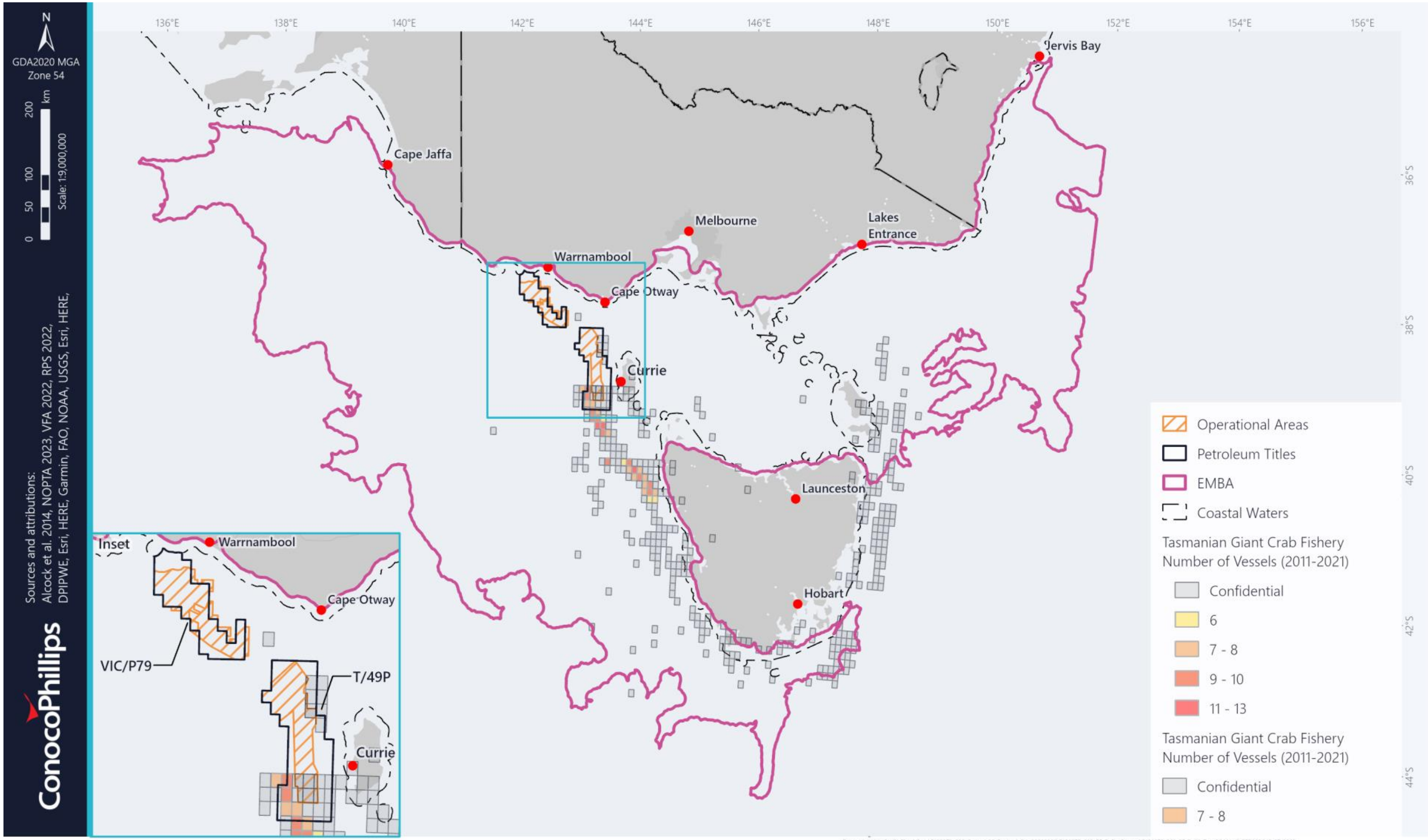


Figure 4-85: Tasmanian Giant Crab Fishery within the EMBA

4.7.8.3. Abalone Fishery

The Tasmanian Abalone Fishery operates in Tasmanian coastal waters (Figure 4-86). For the key target species, blacklip abalone, the fishery is divided into 5 commercial zones, while the greenlip abalone zone is state-wide. Abalone harvesting around King Island is classified as the 'northern zone' and there are 6 abalone fishing zones along the west coast of King Island. Further, there are only 2 divers on King Island who target abalone (KIRDO 2018). The fishery is a major contributor to the Tasmanian economy and is the largest wild abalone fishery in the world contributing around 25% of the annual harvest (DNRET 2022d). Additional detail is provided in Table 4-42.

Table 4-42: Tasmanian Abalone Fishery

Aspects	Description
Primary landing ports	N/A
Target species	Key target species is blacklip abalone (*Haliotis rubra*) with a small amount of greenlip abalone (*Haliotis laevigata*) taken.
Fishing season	Open year round, however the predominant harvest periods are: Blacklip abalone between July and December Greenlip abalone, January to June. Additional zone closures can be put in place depending on stock structure, i.e.: Blacklip abalone: State waters off the NE coast of Tasmania will be closed from 1 January 2023 to 2 July 2023. State waters off the NW coast of Tasmania will be closed from 1 January 2023 to 30 April 2023. State waters off the E coast of Tasmania from Eddystone Point to Whale Head will be closed from 1 January 2023 until 31 March 2023. Greenlip abalone: State waters off the NE coast of Tasmania will be closed from 1 January 2023 to 2 July 2023. State waters off the NW coast of Tasmania will be closed from 1 January 2023 to 30 April 2023.
Licences / Active vessels	121 abalone dive entitlements with 450 quota owning entities of which 3,500 quota units are divided between.
Recent catch within fishery	Total state-wide catch for the last five seasons (subject to available data) were: 2021: 833 t with no assigned value. 2020: 1,018 t worth $50 million. 2019: 1,267 t with no assigned value. 2018: 1,334 t with no assigned value. 2017: 1,561 t worth $70 million.
Overlap with operational area	Fishery does not overlap operational area given harvest restrictions to diveable depths.
Harvest Strategy	The fishery is managed by limiting access through the capping of dive entitlements as well as utilising a system of sizes limits, TAC and regional catch caps.
Sensitivities	Target species is not listed under the EPBC Act.
Existing Pressures	Blacklip abalone: • Stock within the northern, eastern, and bass strait Tasmanian management zones are classified as sustainable. • Stock within the western Tasmanian management zone is classified as depleted. Greenlip abalone: • Stock within the Tasmanian management zone is classified as depleting. • Climate change, specifically the warming of sea temperature, has been identified as being a negative impact on the abalone resource.
Overlap with the EMBA	Abalone harvest on the west coast of King Island in 2020 (Block 1 and 3) was 26.9 t which is 2.65% of the total catch (Mundy and McAllister 2022) or approximately $1.3 million in revenue.
Stakeholder Feedback	No feedback specific to the Tasmanian Abalone Fishery was received during consultation.

Source: DNRET (2022); Mundy and McAllister (2022); DPIPWE (2018); IMAS (2021).

4.7.8.4. Commercial Dive Fishery

The Tasmanian Commercial Dive Fishery selectively harvests three key species by hand from small vessels. They are the short spined sea urchin (*Heliocidaris erythrogramma*), long spined sea urchin (*Centrostephanus* *rodgersii*) and periwinkles (*Lunella undulata*). The urchin fishery operates year-round (1 September to 31 August) and there is no quota allocated to licence holders. However, the short spined sea urchin and periwinkles have a ‘first in first served’ policy and when the total allowable catch is reached in a zone, that zone is closed until the following licensing year. Over the 5 dive zones of the fishery there are currently 53 commercial dive licences (Figure 4-86) (DNRET 2022f). For all species, stock within the Tasmanian management zones are classified as sustainable and are not subject to overfishing (IMAS 2022c).

The short spined sea urchin is traditionally the most valuable and, therefore, preferred target species harvested by the commercial dive fishery in Tasmania. The fishing season is generally from late July until February when the roe is at the highest quality and maximum profitability (DNRET 2022f). The TAC for the short spined sea urchin in the northern zone, including King Island, for the 2022/2023 season is 39 t. The long spined sea urchin initially had an annual catch which remained below 100 tonnes until increasing to 185 tonnes in 2018, 560 t in 2019 and 494 t in 2021 (DNRET 2022f). This emerging fishery has expanded to be the third largest in Tasmania per wet tonnage harvested (IMAS 2022c).

Commercial periwinkle catches have fluctuated throughout the history of the fishery, largely as a result of fishers entering and exiting the industry and/or switching targets to fish alternate species. Most of the catch is taken from the south-east and north-east coasts of Tasmania, with catch rates higher in the south-east than the north-east. The TAC periwinkles in the northern zone, including King Island, for the 2022/2023 season is 16.2 t.

The EMBA overlaps parts of the western, northern and southern coastline of mainland Tasmania as well as King Island and on the eastern coast of the Furneaux group of islands where commercial diving occurs (Figure 4-86).

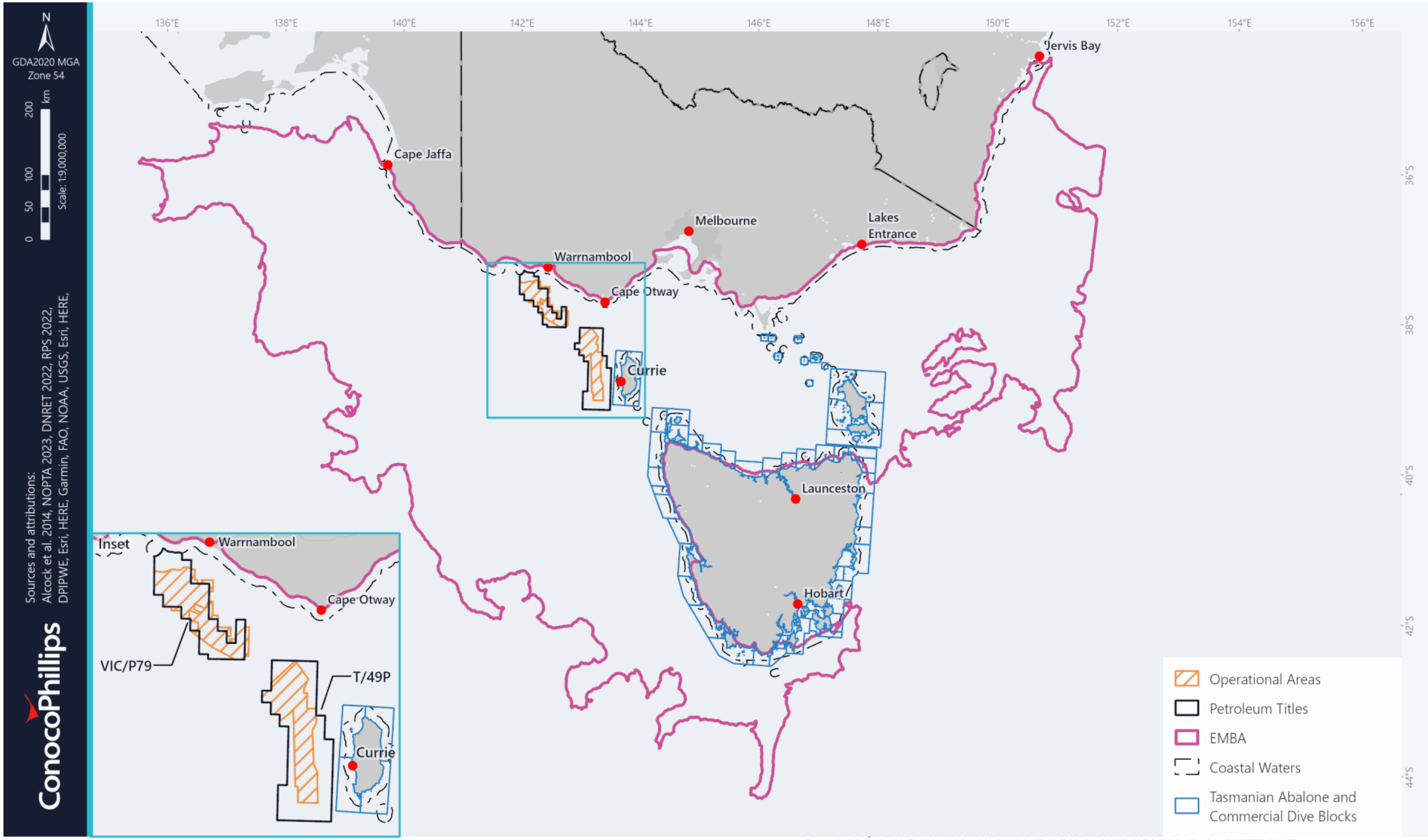


Figure 4-86: Tasmanian Abalone and Commercial Dive Fishery within the EMBA

4.7.8.5. Octopus Fishery

The Tasmanian Octopus Fishery operates off the north coast of Tasmania and in the Bass Strait and covers the entire Tasmanian coastline sharing the same reporting grid as the Scalefish fishery. There are 3 recorded species caught pale octopus (*Octopus pallidus*), Maori octopus (*Macroctopus maorum*) and gloomy octopus (*Octopus tetricus*). The Scalefish Fishery Management Plan (revised in 2015) provides the management framework for the fishery. The commercial fishery has been a sole operator fishery since its commencement in 1980, with two vessels operating in Bass Strait and on the eastern side of Flinders Island (Fraser et al. 2022). Additional detail is provided in Table 4-43.

Table 4-43: Tasmanian Octopus Fishery

Title	Description
Primary landing ports	Tasmanian ports.
Target species	Pale Octopus (*Octopus pallidus*)
Fishing season	Year-round.
Licences / Active vessels (2020-2021)	2 active licences.
Recent catch within fishery	2021: 130 t with no assigned value. 2020: 171.5 t with no assigned value. 2019: 131.8 t with no assigned value. 2018: 129 t with no assigned value. 2017: 64 t with no assigned value.
Overlap with operational area	No known catch recorded
Harvest Strategy	The fishery is mainly managed by a limited access licence and gear restrictions.
Sensitivities	Target species is not listed under the EPBC Act.
Existing Pressures	Stock within the Tasmanian management zone is classified as depleting.
Overlap with the EMBA	Catch data reported in the fishery's 2020/2021 assessment indicates that fishing activity occurs in the EMBA. The EMBA overlaps the majority of Tasmanian octopus fishing blocks.
Stakeholder Feedback	No feedback specific to the octopus fishery was received during consultation.

Sources: SETFIA and Fishwell Consulting (2020); Fraser et al. (2022a).

4.7.8.6. Scalefish Fishery

The Tasmanian Scalefish Fishery is a multi-species and multi-gear fishery that is predominantly made up of small owner operated commercial businesses. The fishery targets multiple species and therefore uses multiple gear-types including, but not limited to, drop-line, Danish seine, fish trap, hand-line and spear (DNRET 2022c). The fishery covers the entire Tasmanian coastline and shares the same reporting grid as the Octopus fishery (Figure 4-87). Additional detail is provided in Table 4-44.

Table 4-44: Tasmanian Scalefish Fishery

Title	Description
Primary landing ports	Tasmanian ports
Target species	Banded morwong (*Cheilodactylus spectabilis*), southern calmari (*Sepioteuthis australis*), southern garfish (*Hyporhamphus melanochir*), wrasse (*Notolabrus sp*.), tiger flathead (*Neoplatycephalus richardsoni*), southern school whiting (*Sillago flindersi*) east Australian salmon (*Arripis trutta*), barracouta (*Thyrsites atun*), bastard trumpeter (*Latridopsis forsteri*), blue warehou (*Seriolella brama*) and Golud's squid (*Nototodarus gouldi*)
Fishing season	Year-round. Restrictions and closures may apply for individual species.

Licences / Active vessels	106 active licences in 2020. 259 vessels operating in 2017/18 across the fishery.
Recent catch within fishery	2020: 237 t with no assigned value. 2019: 178 t with no assigned value. 2018: 257 t with no assigned value. 2017: 318 t with no assigned value. 2016: 312 t with no assigned value.
Overlap with operational area	No known catch recorded
Harvest Strategy	The fishery is managed through capped licence numbers, closed seasons, gear restrictions and min/max size limits. Further, the banded morwong on the east coast has a quota management system in place.
Sensitivities	Target species are not listed under the EPBC Act.
Existing Pressures	East Australian salmon, wrasse, Gould's squid, and tiger flathead stock within the Tasmanian management zone are classified as sustainable. Southern calamari stock within the Tasmanian management zone is classified as depleting. Bastard trumpeter, southern garfish and blue warehou stock within the Tasmanian management zone are classified as depleted. Barracouta stock within the Tasmanian management zone is classified as undefined.
Overlap with the EMBA	Catch data reported in the fishery's 2020/2021 assessment indicates that fishing activity occurs in the EMBA. The EMBA overlaps the majority of Tasmanian Scalefish fishing blocks with the exception of the east coast blocks.
Stakeholder Feedback	No feedback specific to the scalefish fishery was received during consultation.

Sources: DNRET (2022c); SETFIA and Fishwell Consulting (2020); Fraser et al. (2022b); Krueck et al. (2020); IMAS (2020).

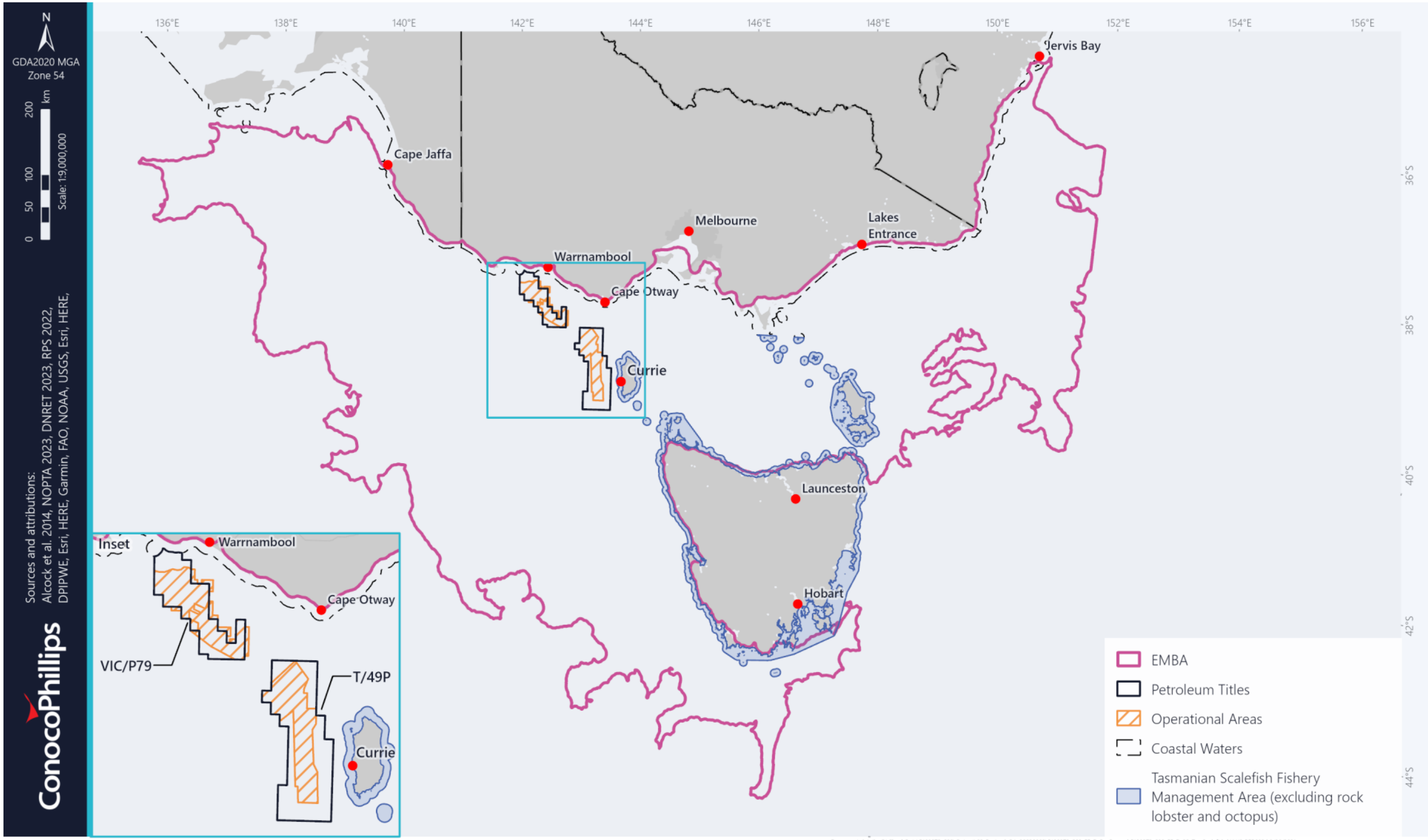


Figure 4-87: Tasmanian Scalefish Fishery within the EMBA

4.7.8.7. Scallop Fishery

The Tasmanian scallop fishery extends to 200 nautical miles from the Tasmanian coast, with the exception of Bass Strait, where its jurisdiction covers 3-20 nautical miles offshore. Scallops are harvested commercial utilising a benthic scallop dredge, which is towed along the sea floor and scoops scallops into the dredge. The Scallop fishery was closed in 2016 due to low stock numbers. Following the completion of scallop surveys and a recommendation by the Scallop Fishery Advisory Committee (ScFAC), an opening of the commercial scallop fishery has been approved by the Minister for 2022 (DNRET 2022e). Additional detail is provided in Table 4-45.

Table 4-45: Tasmanian Scallop Fishery

Title	Description
Primary landing ports	Stanley, Triabunna, St Helens
Target species	Commercial scallop (*Pecten fumatus*)
Fishing season	Open for the first time since 2016 24 June 2022 – 31 December 2022
Licences / Active vessels (2015-2016)	11 active licences 2015. 11 active vessels in 2015.
Recent catch within fishery*	As of 12 January 2023: 2022 – 3,329 t with no assigned value.
Overlap with operational area	No known catch recorded
Harvest Strategy	The fishery is managed by a TAC, individual transferable quotas, and utilises a spatial approach to stock management. This approach means that all state waters are closed to fishing except in certain areas that meet the opening criteria. Each year the scallop fishery undergoes a process of scallop surveys, comprising exploratory surveys where scallop fishers search for viable commercial scallop beds. Once a viable scallop bed or area is identified it undergoes targeted surveys to collect information such scallop size frequency, scallop density and biomass. This information will inform the decision whether to open the area or not.
Sensitivities	Target species is not listed under the EPBC Act.
Existing Pressures	The most recent stock assessment for the fishery (2019) classifies the stock status as depleted and overfished. The target species can be prone to die-off events and disease.
Overlap with the EMBA	The EMBA overlaps the north west 2022 open area for the season. However, it does not overlap the lower east 2022 open area for the season.
Stakeholder Feedback	No feedback specific to the scallop fishery was received during consultation.

Sources: DNRET (2022e); SETFIA and Fishwell Consulting (2020); Semmens et al. (2020).
*Data for years prior is not available as the fishery was closed from 2016-2021

4.7.8.8. Marine Plant Fishery

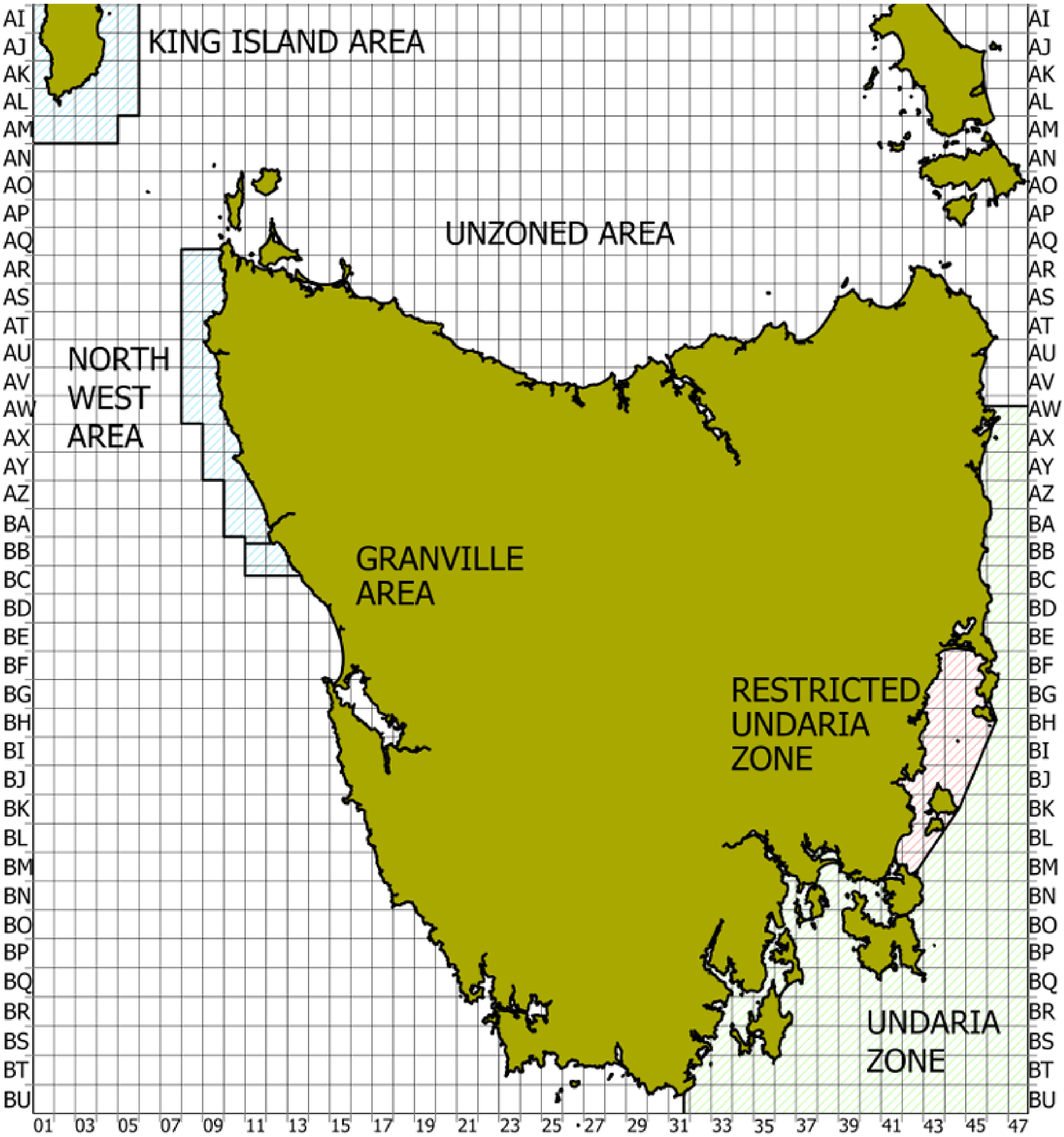
The Tasmanian Marine Plant Fishery operates in Tasmanian coastal waters. The 2 main harvested species of seaweed in Tasmania are bull kelp and undaria. Seaweeds are only able to be harvested when they wash ashore as the collection of native seaweed species if they are attached to substrate or the seabed is prohibited. However, undaria is not native to Australian waters and is considered a marine pest which allows licence holders to dive and hand collect this species. Specific access areas have been established along the coast which include King Island and Granville Harbour (bull kelp harvest) and an east coast undaria zone (Source: DNRET 2022i

Figure 4-88). Kelp harvesting on King Island generates approximately $2.5 million annually (DPIPWE 2017). An exclusive licence is held by one company – Kelp Industries Pty Ltd who has rights to process all kelp harvested on the island. Additional detail is provided in Table 4-46.

Table 4-46: Tasmanian Marine Plant Fishery

Title	Description
Primary landing ports	N/A
Target species	Bull kelp (*Nereocystis luetkeana*) and wakame (*Undaria pinnatifida*).
Fishing season	Year round.
Licences / Active vessels (2017)	As of 2017 – 70 licence holders in Tasmania however only a small portion were active.
Recent catch within fishery	The annual average harvest on King Island is above 1200 t (dried weight) and supplies approximately 5 % of the world production of alginates.
Harvest Strategy	The fishery is mainly managed by licence requirements and restrictions.
Sensitivities	Target species are not listed under the EPBC Act.
Existing Pressures	There is no fishery status assessment, however the current scale of the fishery is small and species are unlikely to be overharvested. The fishery is largely focused on cast weed which is a sporadic resource that varies with season and weather. This results in erratic availability and impacts collecting availability.
Overlap with the EMBA	Kelp harvesting occurs on the west coast of Tasmania and King Island. *Undaria pinnatifida* harvesting occurs on the east coast of Tasmania. On King Island seaweed is harvested between Cape Wickham and approximately 5 km due south of Ettrick Beach, the south coast of King Island from Surprise Bay to the east of Stokes point and the south-east coast of King Island from three areas around red Hut Point, Grassy harbour and City of Melbourne Bay. The EMBA overlaps the entire coastline and shoreline of King island as well as the coastline of western Tasmania. Further, only a portion of the eastern coastline of Tasmania is overlapped by the EMBA.
Stakeholder Feedback	During consultation the value of the kelp industry to King Island was identified (Org ID: 593, Event ID: 2512, FB ID: 168; Org ID:615, Event ID: 31, FB ID: 23). ConocoPhillips Australia provided information on impact assessments for seabed surveys and drilling activities which do not identify a cause effect pathway for impacts.

Sources: DPIPWE (2017); SETFIA and Fishwell Consulting (2020).



Source: DNRET 2022i

Figure 4-88: Tasmanian Marine Plant Fishery Zone Map

4.7.9. South Australian Managed Fisheries

South Australian state fisheries are managed by the Department of Primary Industries and Regions (DPIR) under the *Fisheries Management Act 2007*. DPIR jurisdiction covers all waters that are within the limits of the state with additional offshore constitutional settlements for specific fisheries beyond state boundaries into Commonwealth waters. South Australian-managed commercial fisheries with access licences that authorise harvest in the EMBA are detailed within Table 4-47. Though certain fisheries possess jurisdiction to fish within the EMBA, analysis of publicly available and requested catch data indicates that not all fisheries have recently actively fished within the EMBA. Only fisheries with active fishing occurring in the EMBA in the last 10 years will be assessed further.

Table 4-47: South Australian state managed fisheries within the EMBA

South Australian-managed Fisheries	Active Fishing within the EMBAs in the last 10 years
Abalone	✓
Blue Crab	X
Charter Boat	✓
Lake Eyre Basin	X
Lakes and Coorong	X
Giant Crab	✓
Marine Scalefish	✓
Miscellaneous	✓
Prawn (Gulf of Vincent)	X
Prawn (Spencer Gulf and West Coast)	X
River	X
Sardine	✓
Rock Lobster	✓

Source: PIRSA (2022) (personal communication, 5 September 2022).

4.7.9.1. Abalone Fishery

The commercial abalone fishery is divided into 3 zones; western zone, central zone and the southern zone (Figure 4-89). Abalone typically inhabit subtidal reefs as far as 30 m offshore. Commercial abalone divers mostly operate from large, trailered boats. Divers use surface supplied air from the boat and may use motorised cages to mitigate physical interactions with white sharks. Additional detail in Table 4-48.

Table 4-48: South Australian Abalone Fishery

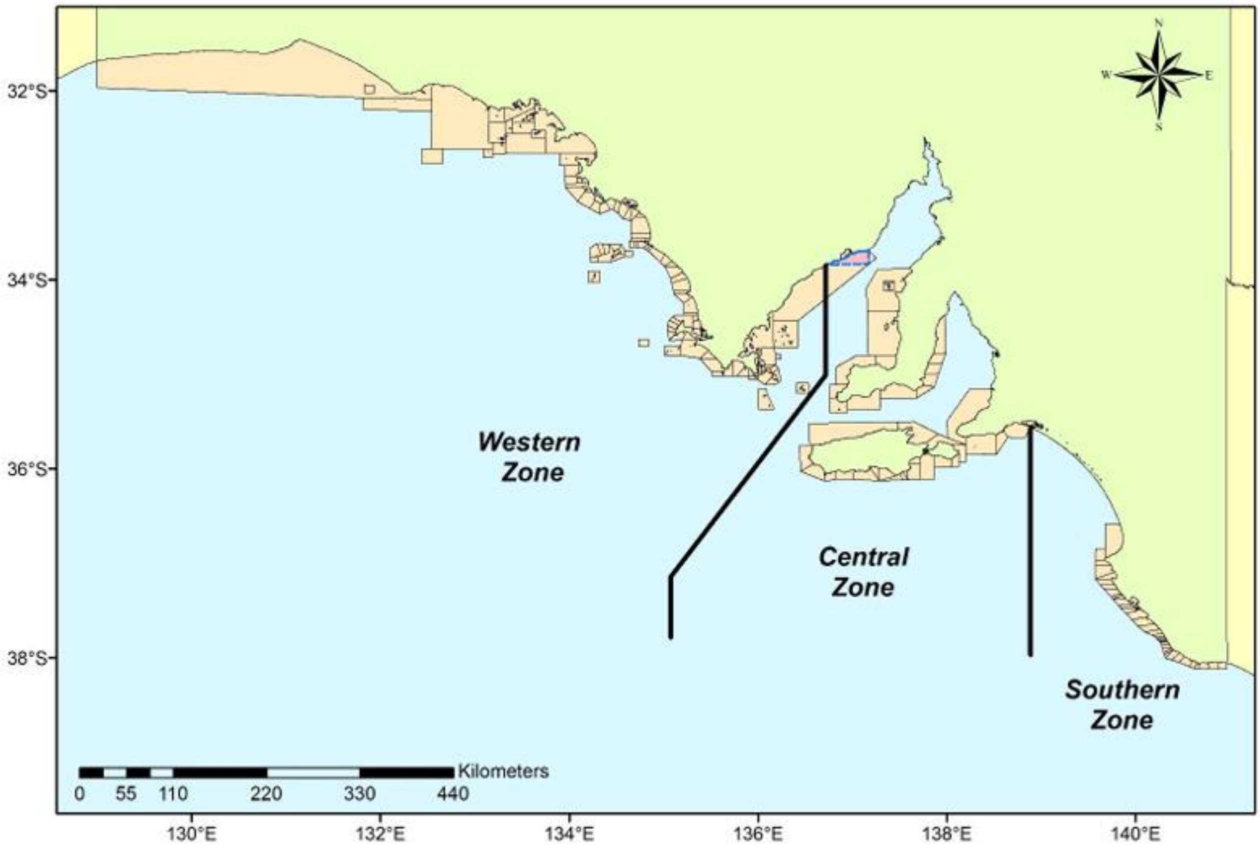
Title	Description
Primary landing ports	N/A
Target species	Greenlip abalone (*Haliotis laevigata*) and blacklip abalone (*Haliotis rubra*).
Fishing season	Year-round.
Licences / Active vessels (2020-2021)	34 active licences.
Recent catch within fishery	2020: 493 t valued at $18.3 million. 2019: 509 t valued at $22.3 million. 2018: 658 t valued at $29.6 million. 2017: 700 t valued at $28.6 million.
Harvest Strategy	The fishery is managed primarily by an annual total allowable commercial catch which is determined by the most recent stock assessment.
Sensitivities	Target species are not listed under the EPBC Act.
Existing Pressures	Stock within the western and southern South Australia management zones are classified as sustainable. Stock within the central South Australian management zone is classified as depleted.
Overlap with the EMBA	The EMBA overlaps the southern zone of the fishery. In 2020 the southern zone accounted for 16.2% of total profit (113.8t)
Stakeholder Feedback	No feedback specific to the SAAF was received during consultation.

Source: PIRSA (2021a); BDO Australia (2022a); Mundy et al. (2021); PIRSA (2022) (personal communication, 5 September 2022).

4.7.9.2. Charter Boat Fishery

Charter boat fishing is considered a commercial platform for recreational fishing which is managed through a licensing and registration system. All catch from the fishery is therefore regarded as recreational catch. Each charter will have bag, boat, size and trip limits which may vary from limits that apply to individual recreational fishers. In the 2020/2021 season there are 47 active licences and primary target species identified by the industry are snapper, King George whiting, southern bluefin tuna and nannygai (redfish, red snapper, swallowtail) (Durante et al. 2022).

There is overlap of the EMBA and the south-east management area of the charter boat fishery (Figure 4-90). In the 2020/2021 season Victor Harbour and the south-east accounted for 2.5% of the catch and other offshore and shelf regions accounted for 0.1% of the catch (Durante et al. 2022).



Source: Burnell et al. 2021

Figure 4-89: Management zones of the South Australian Abalone Fishery

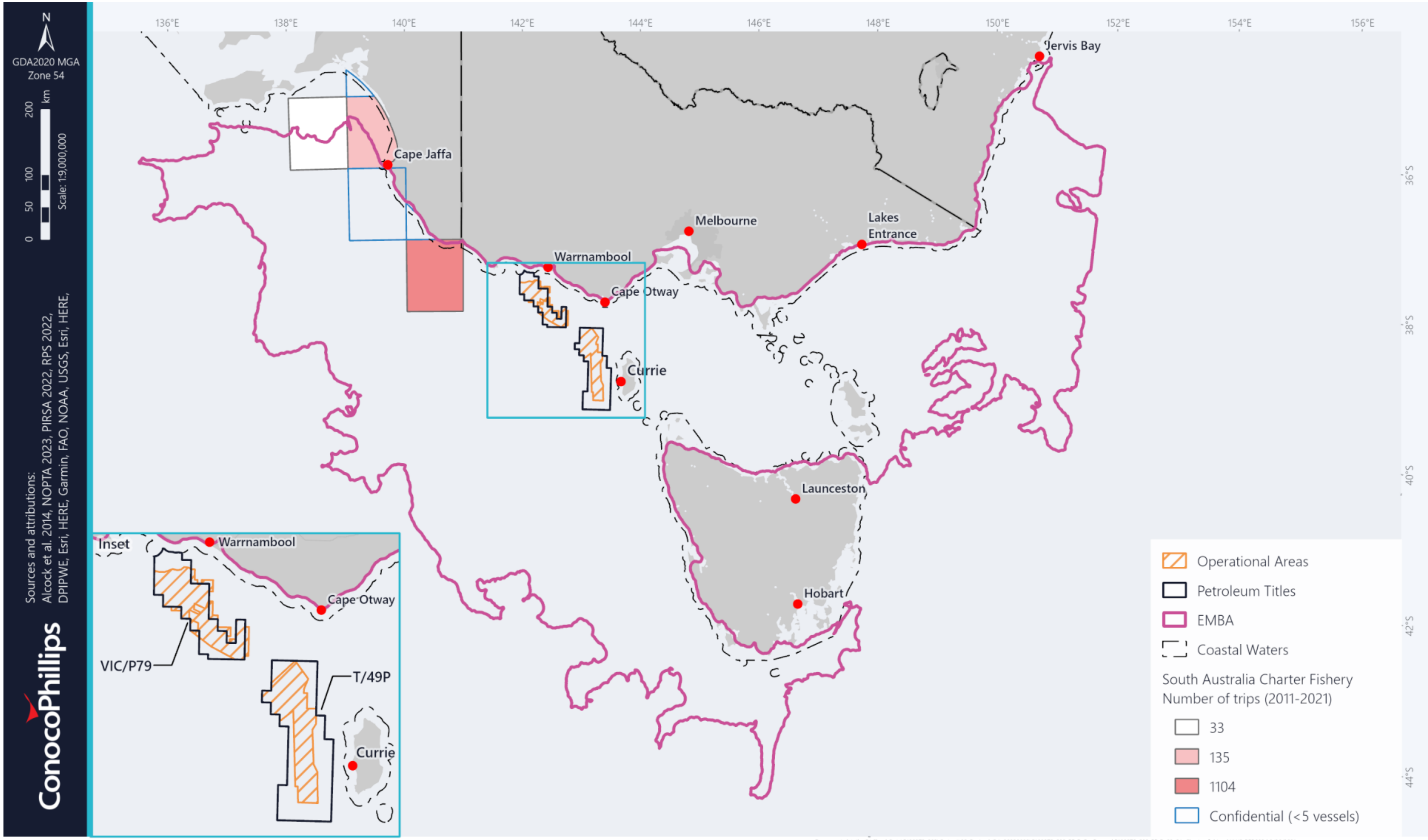


Figure 4-90: South Australian Charter Boat Fishery within the EMBA

4.7.9.3. Miscellaneous Fishery

The Miscellaneous Fishery includes species that are not in management arrangements of existing commercial fisheries, are specialised fisheries or use multiple types of fishing gear. Many of the fisheries included are low production, low value, or both and biological information on most of the species is limited. Species taken include sea urchins, scallop, giant crab, beachcast seagrass and macro-algae, etc (PIRSA 2022b) (Figure 4-91). There is no overarching management plan for the Miscellaneous Fishery however policies are available for the giant crab and a range of species taken by dive fishing. Only species with known fishing intensity in the EMBA will be considered and discussed below in Table 4-49.

Table 4-49: South Australian Giant Crab Fishery

Title	Description
Primary landing ports	South Australia ports
Target species	Giant crab (*Pseudocarcinus gigas*)
Fishing season	1 of October to the 31 May
Licences / Active vessels (2019-2020)	15 active licences: 1 in the Miscellaneous Fishery 14 in the South Australian Rock Lobster Fishery
Recent catch within fishery*	2020: 15.4 t with no assigned value. 2019: 14.2 t with no assigned value. 2018: 18.1 t with no assigned value. 2017: 18.4 t with no assigned value.
Harvest Strategy	The fishery is managed through 2 zones, the northern zone and the southern zone which have total allowable commercial catch requirements set annually.
Sensitivities	Target species are not listed under the EPBC Act.
Existing Pressures	As of 2020 catches of giant crab in the last 8 seasons have been among the lowest since 1999 even though populations remain in relatively stable and sustainable levels.
Overlap with the EMBA	The EMBA overlaps the southern zone of the fishery. Giant crab fishery catch and effort data provided by the Department of Primary Industries and Region South Australia (PIRSA) from 2012 to 2021 show that there is recorded fishing intensity within this zone.
Stakeholder Feedback	No feedback specific to the SAGCF was received during consultation.

Source: McLeay (2022); PIRSA (2022) (personal communication, 5 September 2022).

* Due to the small size of the activity, socio-economic information for commercial fishing for giant crab is not formally reported

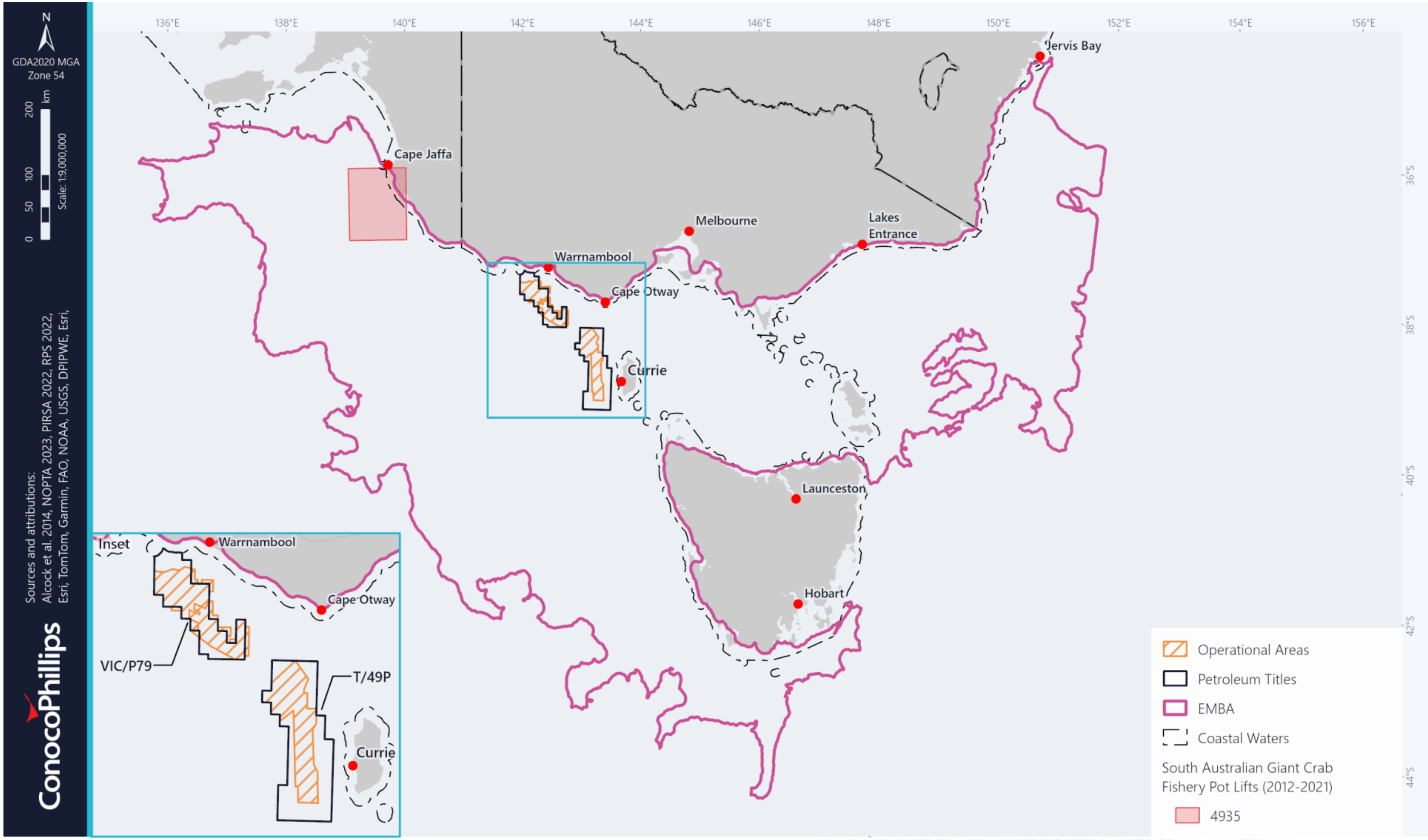


Figure 4-91: South Australian Giant Crab Fishery within the EMBA

4.7.9.4. Marine Scalefish Fishery

The commercial Marine Scalefish Fishery (MSF) is a multi-species and multi-gear fishery. Commercial fishing can be undertaken for more than 60 species of scalefish using a range of gear types in South Australian coastal waters. The MSF operates in all coastal waters of South Australia between the WA and Victorian borders. For some species the Offshore Constitutional Settlement extends the fishery area out 200 nautical miles to the Australian Exclusive Economic Zone miles (Figure 4-92). Additional detail in Table 4-50.

Table 4-50: South Australian Marine Scalefish Fishery

Title	Description
Primary landing ports	South Australia ports
Target species	The key target species are King George whiting (*Sillaginodes punctatus*), southern garfish (*Hyporhamphus melanochir*) and the southern calamari (*Sepioteuthis australis*) and snapper (*Chrysophrys auratus*).
Fishing season	Year-round. However, there are closed areas and seasonal closed areas for specific species. Between November 2019 – January 2023 the south east snapper fishery area is the only fishing zone open.
Licences / Active vessels (2020-2021)	264 active licences.
Recent catch within fishery	2020: 1,689 t valued at $19.1 million. 2019: 2,130 t valued at $20.5 million. 2018: 2,099 t valued at $21.3 million. 2017: 2,303 t valued at $24 million. 2016: 2,519 t valued at $24.5 million. 2015: 2,550 t valued at $24.5 million.
Harvest Strategy	The fishery is managed through 4 zones each with a tiered management framework. Methods utilised include a TAC, an individual transferable quota as well as a number of input controls. From Nov 2019 to January 2023 the south east snapper fishery area is the only zone open.
Sensitivities	Target species are not listed under the EPBC Act.
Existing Pressures	The southern calamari and King George whiting stock within the entire management area are classified as sustainable. The snapper stock in the south east management area is classified as sustainable. The southern garfish stock within the south east management area is undefined due to negligible landed catch in the past 37 years.
Overlap with the EMBA	The EMBA intersects the southern zone of the fishery. Since 2000 fishing effort has largely contracted to within the gulfs and fishing intensity around the regional centres has diminished to relatively low levels. Between 2017 - 2020 the majority of fishing effort was distributed between the Spencer Gulf zone and the Gulf of St. Vincent/Kangaroo Island zone.
Stakeholder Feedback	No feedback specific to the SAMSF was received during consultation.

Source: PIRSA (2021c); BDO Australia (2022a); Smart et al. (2022).

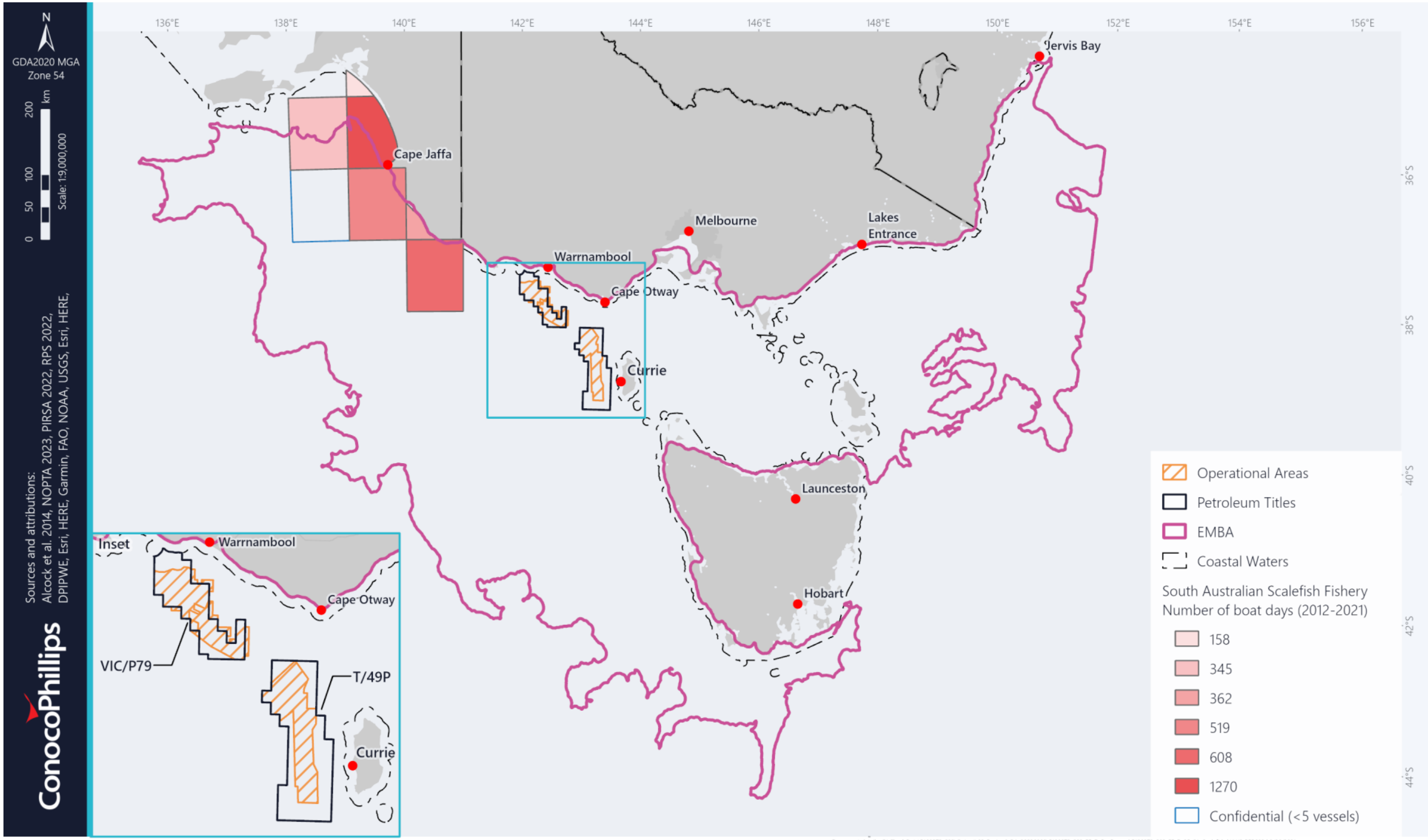


Figure 4-92: South Australian Marine Scalefish Fishery within the EMBA

4.7.9.5. Sardine Fishery

The area of the fishery includes all South Australian waters out to the 200 nm Australian Exclusive Economic Zone. The South Australian sardine fishery targets the Australian sardine (*Sardinops sagax*) and is a component of the MSF. Additional detail in Table 4-51.

Table 4-51: South Australian Sardine Fishery

Title	Description
Primary landing ports	South Australia ports
Target species	Key target species is the Australian sardine (*Sardinops sagax*). Other species may include Australian anchovy (*Engraulis australis*), maray (*Clupea sagax*), sandy sprat (*Hyperlophus vittatus*) and blue sprat (*Spratelloides robustus*).
Fishing season	Year-round.
Licences / Active vessels (2020-2021)	14 active licences.
Recent catch within fishery	2020: 38,024 t valued at $24 million. 2019: 39,889 t valued at $27.5 million. 2018: 40,041 t valued at $27.4 million. 2017: 43,293 t valued at $27.8 million.
Harvest Strategy	The fishery has a tiered strategy which sets its TAC based on the spawning biomass and level of research and monitoring. The limit reference point for sustainability is currently 75,000 t.
Sensitivities	Target species are not listed under the EPBC Act.
Existing Pressures	Stock within the South Australian management area is classified as sustainable.
Overlap with the EMBA	The EMBA overlaps with the eastern blocks of the outside zone.
Stakeholder Feedback	No feedback specific to the sardine fishery was received during consultation.

Source: PIRSA (2021b); BDO Australia (2022a); Ward et al. (2021)

4.7.9.6. Rock Lobster Fishery

The South Australian Rock Lobster fishery is based on the capture of Southern rock lobster (*Jasus edwardsii*). Commercial licence holders are able to take and sell giant crab and octopus that are taken as a by-product in rock lobster pots and may also harvest marine scalefish if endorsed on their licence. The rock lobster fishery is separated into 2 zones; southern zone which includes all marine waters between the mouth of the Murray River and the Victorian border and the northern zone which includes all marine waters between the mouth of the Murray River and the WA border (Figure 4-93). Additional detail in Table 4-52.

Table 4-52: South Australian Rock Lobster Fishery

Title	Description
Primary landing ports	South Australia ports
Target species	Southern rock lobster (*Jasus edwardsii*)
Fishing season	Typically, 1 October to 31 May However, the 2020/21 season was 15 September to 31 July
Licences / Active vessels (2020-2021)	180 active licences
Recent catch within fishery*	2020: 1,275 t valued at $71.7 million. 2019: 1,203 t valued at $106.4 million. 2018: 1,245 t valued at $114.7 million. 2017: 1,246 t valued at $103.2 million. 2016: 1,238 t valued at $107.6 million.

	2015: 1,244 t valued at $123.6 million.
Harvest Strategy	The fishery is managed by a total allowable catch which is set annually and divided between licence holds owning individual transferable quota. Further management strategies include gear restrictions, spatial and temporal closures and the constant monitoring of performance indicators.
Sensitivities	Target species is not listed under the EPBC Act.
Existing Pressures	Stock within the southern zone management area are classified as sustainable.
Overlap with the EMBA	The EMBA overlaps the southern zone of the fishery.
Stakeholder Feedback	No feedback specific to the SARLF was received during consultation.

Source: BDO Australia (2022a); Linnane et al. (2022).
*Based only on data from the southern zone of the South Australian Rock Lobster Fishery

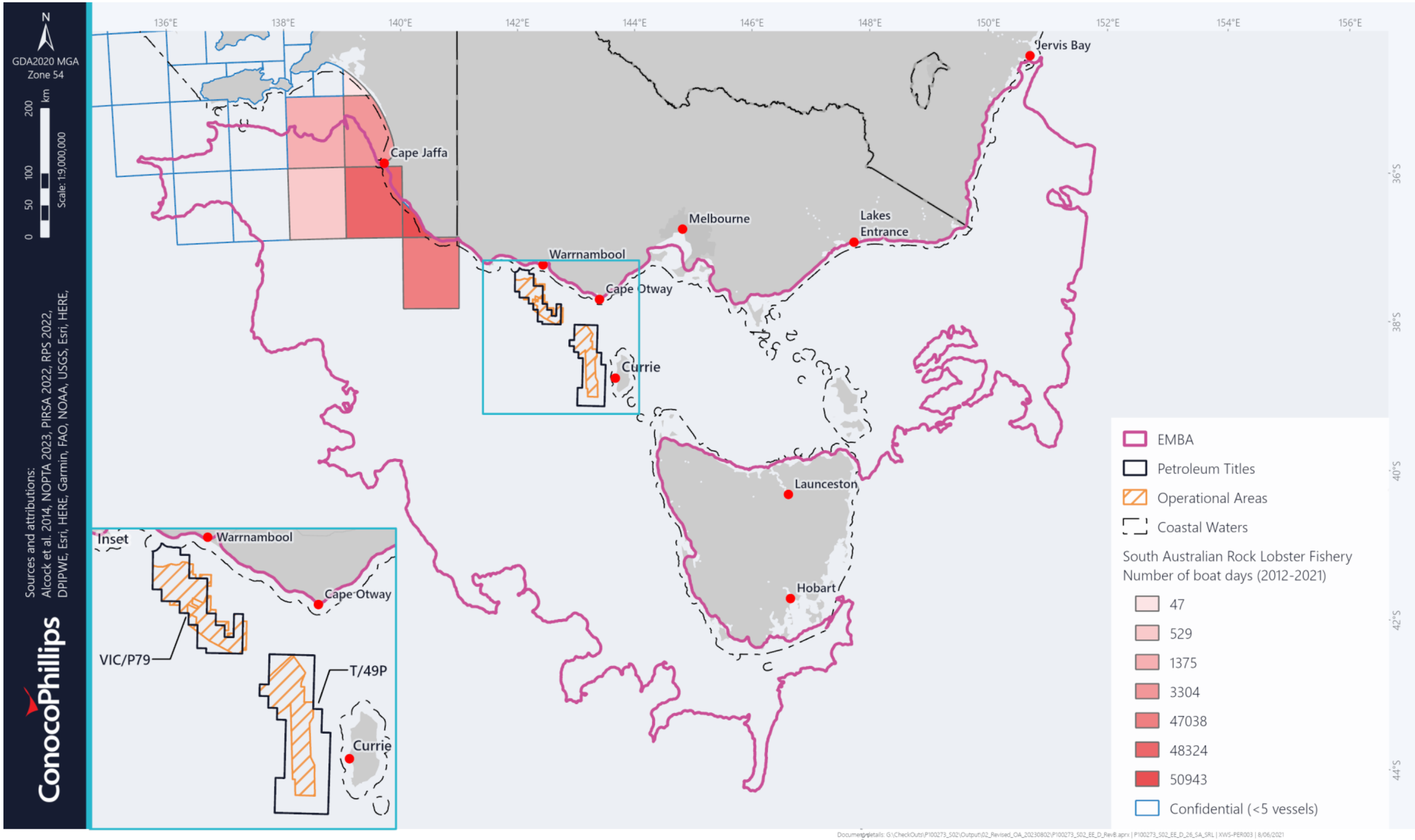


Figure 4-93: South Australian Rock Lobster Fishery within the EMBA

4.7.10. New South Wales (NSW) Managed Fisheries

NSW state fisheries are managed by the Department of Primary Industries (DPI) under the *Fisheries Management Act 1994*. DPI jurisdiction covers all waters that are within the limits of the state with additional offshore constitutional settlements for specific fisheries beyond state boundaries into Commonwealth waters. NSW-managed commercial fisheries with access licences that authorise harvest in the EMBA are detailed within Table 4-53. Though certain fisheries possess jurisdiction to fish within the area, analysis of publicly available and requested catch data indicates that not all fisheries have recently actively fished within the EMBA.

Table 4-53: New South Wales state managed fisheries within the EMBAs

New South Wales-managed Fisheries	Active fishing within the EMBAs in the last 10 years
Abalone	✓
Developmental Commercial	X
Estuary General	X
Estuary Prawn Trawl	X
Inland Restricted	X
Lobster	✓
Ocean Hauling	✓
Ocean Trap & Line	✓
Southern Fish Trawl	✓
Ocean Trawl	✓
Sea Urchin and Turban Shell Restricted Fishery	✓
S37 Permit	✓

DPI (2023) (personal communication, 21 April 2023).

4.7.10.1. Abalone Fishery

The NSW Abalone fishery extends along the NSW coastline between the Queensland and Victorian borders. Most commercial abalone fishing takes place on the south coast of NSW, primarily from Jervis Bay to the Victorian border, with most abalone found close to the shore (Figure 4-94). Abalone are commercially harvested from rocky reefs by divers typically using surface-supplied air or scuba. Additional detail is provided in Table 4-54.

Table 4-54: NSW Abalone Fishery

Title	Description
Primary landing ports	NSW ports
Target species	Key target species is blacklip abalone (*Haliotis rubra*)
Fishing season	Year-round.
Active businesses (2019-2020)*	28 active businesses.
Recent catch within fishery	2019: 83 t valued at $3.6 million. 2018: 100 t valued at $3.87 million.** 2017: 128.8 t with unknown value.
Harvest Strategy	The abalone fishery is divided into Spatial Management Units. Each month abalone divers are given monthly catch updates, these detail fishing effort in each SMU. Based on these reports, mandatory recommendations of allowable catch of abalone in each SMU are given to fishers. The SMU system ensures an even distribution of fishing effort across the fishing ground, helping to maintain healthy population levels of abalone throughout the fishery.
Sensitivities	The target species is not a listed species under the EPBC Act.
Existing Pressures	Stock within the management area is classified as undefined.
Overlap with the EMBA	The EMBA overlaps all spatial management units. Units 2-4 are completely overlapped by the EMBA and unit 1 is overlapped between Bermagui and Jervis Bay.

	Between 2016-2021 a total of 620.9 t was landed within the EMBA.
Stakeholder Feedback	No feedback specific to the NSW abalone fishery was received during consultation.

Source: DPI (2022b); DPI (2019a); DPI 2018.

*A business is considered active if it was fished for at least one day during the year

**At the time of publishment in September 2018 69% of the TACC was reported. The 2018 gross value of production (GVP) is expected to be $3.87 million, assuming the 100t TACC is reached.

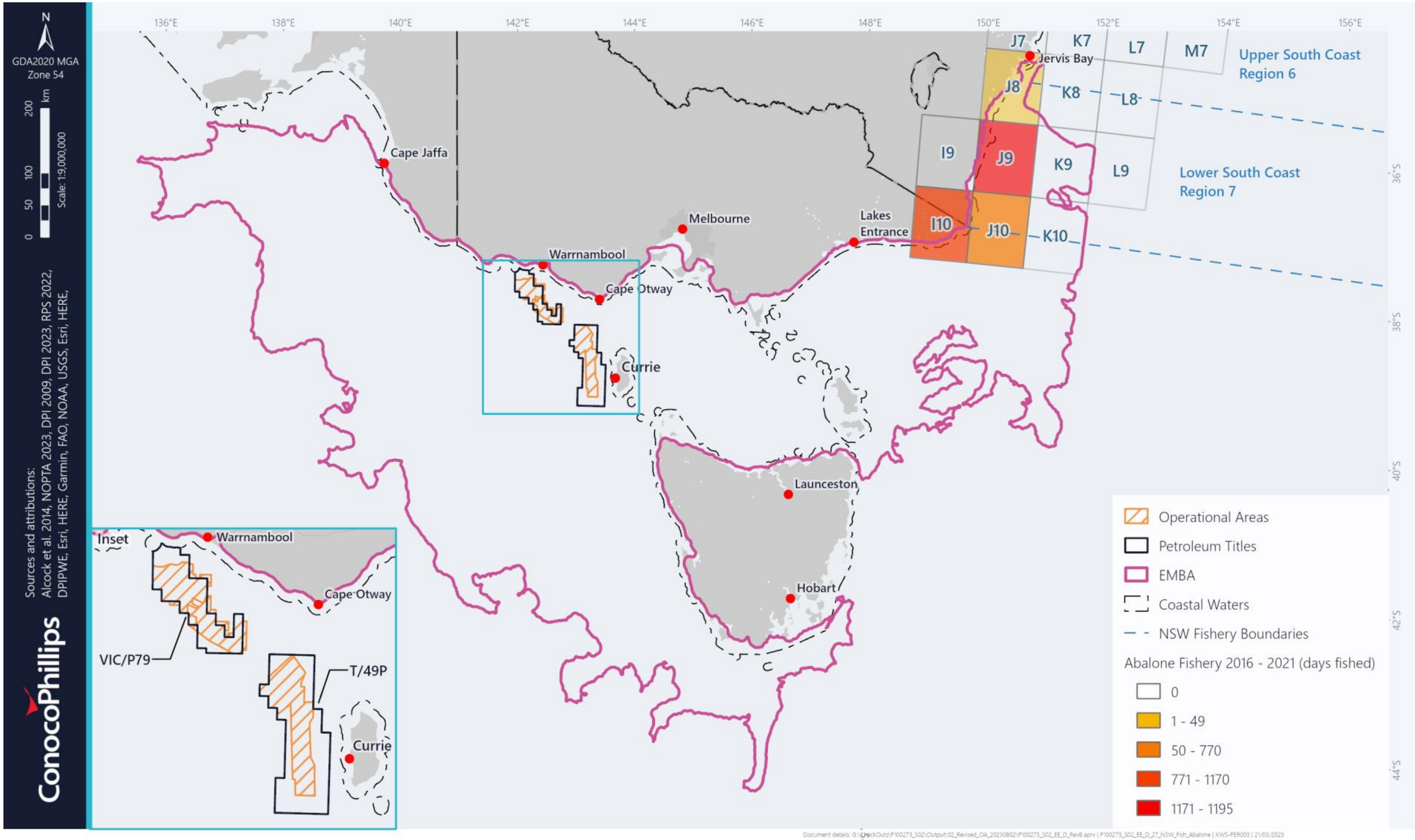


Figure 4-94: NSW Abalone Fishery within the EMBA

4.7.10.2. Lobster Fishery

The NSW Lobster Fishery extends from the Queensland border to the Victorian border and includes all waters under jurisdiction of NSW to around 80 miles from the coast (Figure 4-95). It is characterised by both inshore and offshore sectors. Additional detail is provided in Table 4-55.

Table 4-55: NSW Lobster Fishery

Title	Description
Primary landing ports	NSW ports
Target species	Key target species is eastern rock lobster (*Sagmaraisus verreauxi*)
Fishing season	1 August to 3 May Monthly landings are typically highest in December and January
Active businesses (2019-2020)	67 active businesses.
Recent catch within fishery	2019: 178 t valued at $10.9 million. 2018: 170 t valued at $13.75 million. 2017: 157.5 t valued at $12.02 million. 2016: 154.6 t valued at $11.33 million. 2015: 160.2 t valued at $12.12 million.
Harvest Strategy	The fishery is primarily managed by total allowable commercial catch and individual quota allocation with additional input controls such as a prohibition on taking berried females and minimum/maximum size limits.
Sensitivities	The target species is not a listed species under the EPBC Act.
Existing Pressures	Stock within the management area is classified as sustainable.
Overlap with the EMBA	The EMBA overlaps with Lobster region 4 which includes ocean zones 8, 9 and 10. In the 2019-2020 season there were 11 active businesses within this region. Between 2016-2021 a total of 242 t was landed within the EMBA.
Stakeholder Feedback	No feedback specific to the NSW lobster fishery was received during consultation.

Source: DPI (2019b); DPI (2022b); DPI (2023) (personal communication, 21 April 2023).

4.7.10.3. Ocean Hauling Fishery

The Ocean Hauling fishery targets approximately 20 finfish species using commercial hauling and purse seine nets from sea beaches and in ocean waters within 3 nautical miles of the NSW coast (Figure 4-96). The ocean hauling fishery became a restricted fishery in 1995 and moved to a share management fishery in 2007. Additional detail is provided in Table 4-56.

Table 4-56: NSW Ocean Hauling Fishery

Title	Description
Primary landing ports	NSW ports
Target species	Majority of catch is made up of pilchards (*Sardinops sagax*), sea mullet (*Mugil cephalus*), Australian salmon (*Arripis trutta*), blue mackerel (*Scomber australasicus*), Yellowtail Scad (*Trachurus novaezelandiae*) and Yellowfin Bream (*Acanthopagrus australis*).
Fishing season	Year-round. Restrictions and closures may apply for individual species or specific locations.
Active businesses (2019-2020)	69 active businesses.
Recent catch within fishery*	2019 – 3,886 t valued at $10 million.
Harvest Strategy	The fishery is managed by input controls which limit the fishing capacity of fishers by indirectly controlling the amount of fish caught. These controls include regulating the size and dimensions of fishing gear used, limiting the number of fishers who have access to each part of the fishery, entry criteria for new entrants and a range of closures including seasonal and weekend closures.
Sensitivities	The target species are not listed under the EPBC Act.
Existing Pressures	Stock within the management area is classified as sustainable.
Overlap with the EMBA	The EMBA overlaps with the Lower South Coast region which had 9 active businesses in the 2019-2020 season. Between 2016-2021 a total of 6,628.2 t was landed within the EMBA.
Stakeholder Feedback	No feedback specific to the NSW ocean hauling fishery was received during consultation.

Source: DPI (2022b); DPI (2019c); DPI (2023) (personal communication, 21 April 2023).

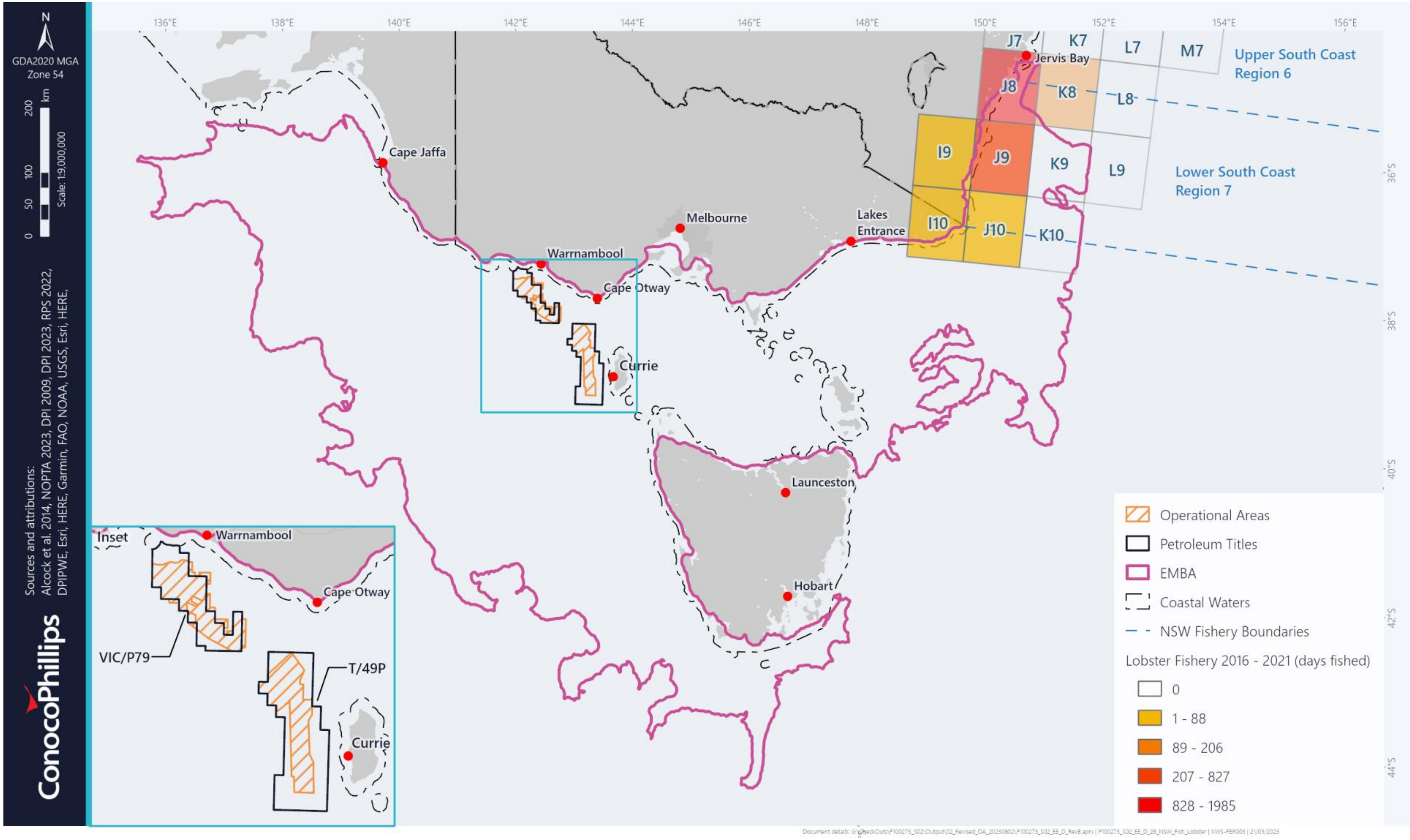


Figure 4-95: NSW Lobster Fishery within the EMBA

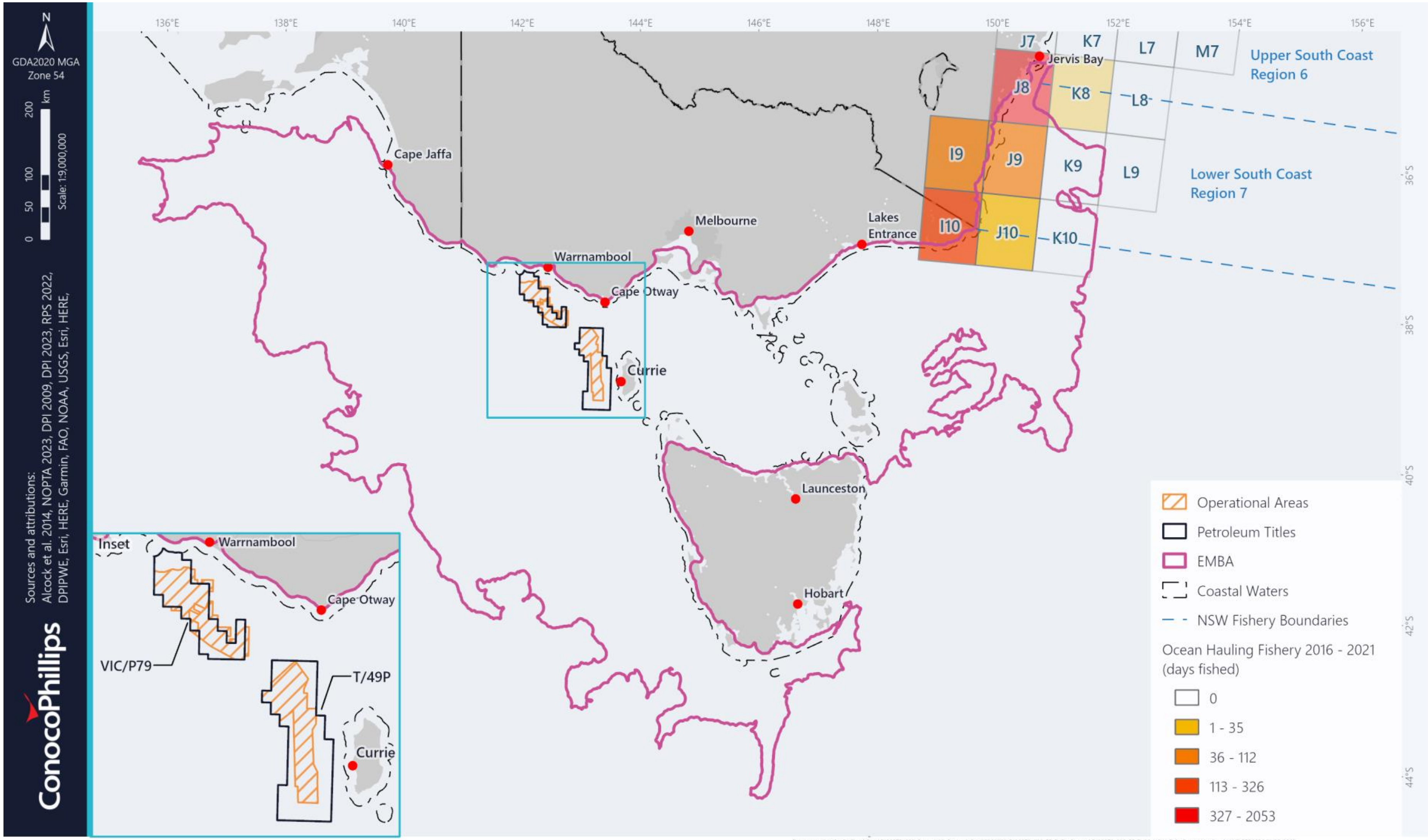


Figure 4-96: NSW Ocean Hauling Fishery within the EMBA

4.7.10.4. Ocean Trap & Line Fishery

The Ocean Trap and Line fishery is a multi-method, multi species fishery targeting demersal and pelagic fish along the entire NSW coast, in continental shelf and slope waters (Figure 4-97). It is a share managed fishery with 6 endorsements which determine the location and methods used by fishers. Additional detail is provided in Table 4-57.

Table 4-57: NSW Ocean Trap & Line Fishery

Title	Description
Primary landing ports	NSW ports
Target species	Snapper (*Chrysophrys auratus*), yellowtail kingfish (*Seriola lalandi*), leatherjackets, bonito (*Sarda australis*), silver trevally (*Pseudocaranz georgianus*), rubberlip (grey) morwong (*Nemadactylus douglasii*), blue-eye trevalla (*Hyperoglyphe antarctica*), sharks, bar cod (*Epinephelus ergastularius*), yellowfin bream (*Acanthopagrus australis*) and spanner crabs (*Ranina ranina*).
Fishing season	Year-round. Restrictions and closures may apply for individual species.
Active businesses (2019-2020)	211 active businesses.
Recent catch within fishery*	2019 – 1,352 t valued at $13 million.
Harvest Strategy	The fishery is managed by input controls which limits the capacity of fishers and indirectly controls how much they catch. This includes restrictions like endorsements, which determines which type of fish along with which fishing gear each fisher is allowed to be used and where.
Sensitivities	Target species are not listed under the EPBC Act with the exception of the school shark which is listed as conservation dependent.
Existing Pressures	The majority of stock within the management area are classified as sustainable. Exceptions are mentioned below: Grey morwong stock is classified as depleted. Silver trevally stock is classified as depleted. School shark stock is classified as depleted.
Overlap with the EMBA	The EMBA overlaps with the Lower South Coast region which had 30 active businesses in the 2019-2020 season. Between 2016-2021 a total of 1,449.9 t was landed within the EMBA.
Stakeholder Feedback	No feedback specific to the NSW trap and line fishery was received during consultation.

Source: DPI (2022b); DPI (2021); DPI (2006); DPI (2023) (personal communication, 21 April 2023).
*Data for prior years is not publicly accessible

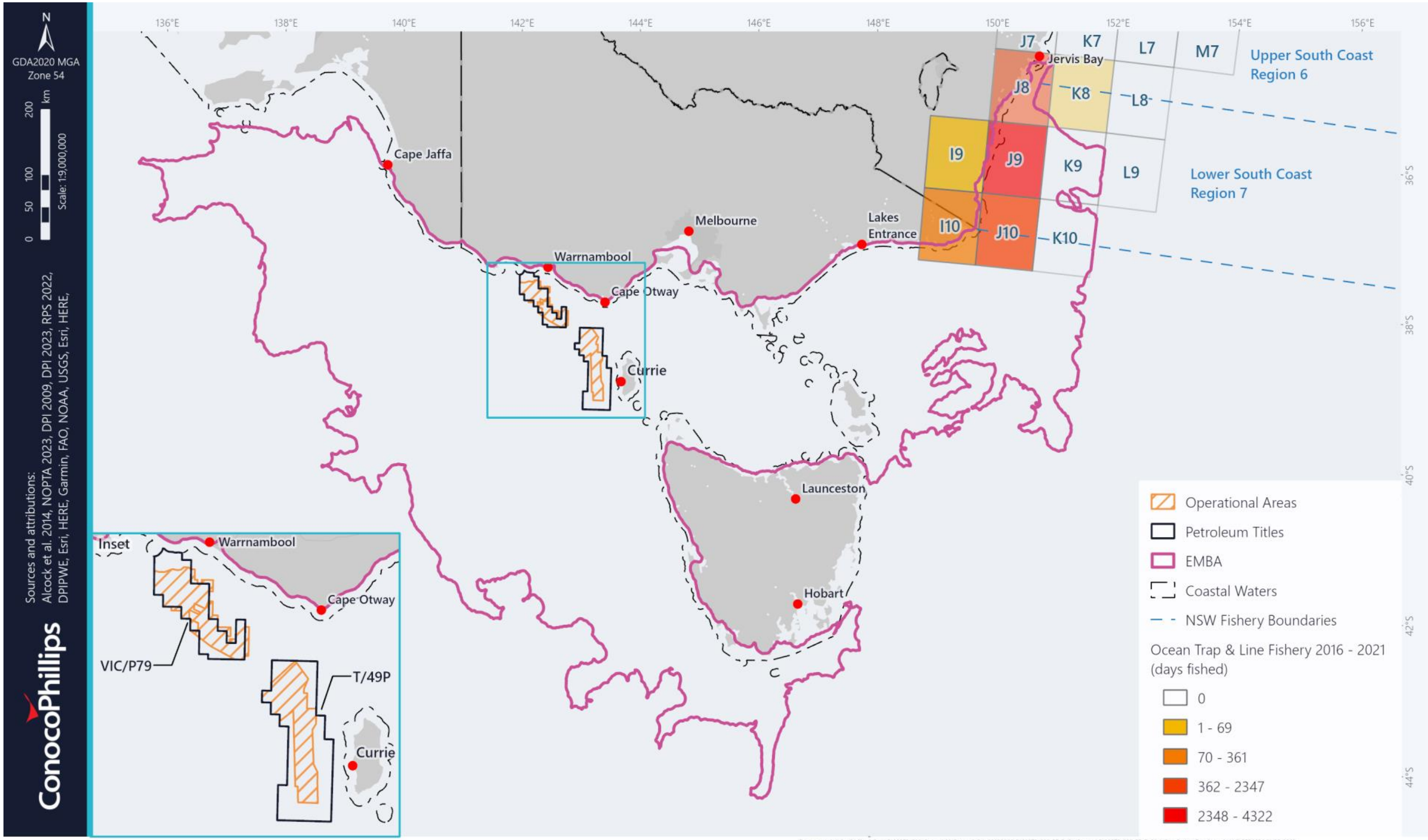


Figure 4-97: NSW Ocean Trap & Line Fishery within the EMBA

4.7.10.5. Ocean Trawl Fishery

There are 2 sectors to the NSW Ocean Trawl Fishery; the prawn trawl sector and the fish trawl sector which operate along the entire NSW coast, in continental shelf and slope waters (Figure 4-98). Both sectors use similar gear, the otter trawl net, and many of the fishers endorsed for fish trawling are also endorsed for prawn trawling. It is a share managed fishery with endorsements outlining fishing methods and location the holder can use and fish within. Additional detail provided in Table 4-58.

Table 4-58: NSW Ocean Trawl Fishery

Title	Description
Primary landing ports	NSW ports
Target species	Key target species include stout whiting (*Sillago robusta*), red spot whiting (*Sillago flindersi*), eastern king prawn (*Melicertus plebejus*), eastern school prawn (*Metapenaeus macleayi*), royal red prawn (*Hailporpides sibogae*), tiger flathead (*Platycephalus richardsoni*), silver trevally (*Pseudocaranz georgianus*), various species of sharks and rays, squid and octopus.
Fishing season	Year-round. Restrictions and closures may apply for individual species.
Active businesses (2019-2020)	96 active businesses.
Recent catch within fishery*	2019 – 2,672 t valued at $26.2 million.
Harvest Strategy	The fishery is managed by input controls which limits the capacity of fishers and indirectly controls how much they catch. This includes restrictions like endorsements, which determines which type of fish along with which fishing gear each fisher is allowed to be used and where.
Sensitivities	Target species not listed under the EPBC Act with the exception of the school shark which is listed as conservation dependent.
Existing Pressures	The majority of stock within the management area are classified as sustainable. Exceptions are mentioned below. Silver trevally stock is classified as depleted. School shark stock is classified as depleted.
Overlap with the EMBA	The EMBA overlaps with a portion of Ocean Trawl region 3 which includes Ocean Zone 6 south of Barrenjoey Point, and Ocean Zones 7, 8, 9 and 10. In the 2019-2020 season there were 6 active businesses within this region. Between 2016-2021 a total of 28.9 t was landed within the EMBA.
Stakeholder Feedback	No feedback specific to the NSW ocean trawl fishery was received during consultation.

Source: DPI (2022b); DPI (2021); DPI (2023) (personal communication, 21 April 2023).

4.7.10.6. Estuary General Fishery

The Estuary General Fishery is a diverse multi-species multi-method fishery operating throughout 76 of NSW's estuarine systems. It is the most diverse commercial fishery in NSW and comprises approximately 600 fishing businesses authorised to utilise 17 types of fishing gear (DPI 2019c). There are 10 species that make up 80% of the landing; sea mullet (*Mugil cephalus*), luderick (*Girella tricuspidata*), yellowfin bream (*Acanthopagrus australis)*, school prawn (*Metapenaeus macleayi*), blue swimmer crab (*Portunus pelagicus*), dusky flathead (*Platycephalus fuscus*), sand whiting (*Sillago ciliata*), pipi (*Donax deltoides*), mud crab (*Scylla serrata*) and silver biddy (*Gerres subfasciatus*). During the 2019-2020 season 2,784 t was caught and valued at $23 million (DPI 2022b). The fishery is divided geographically into 7 regions along the NSW coastline. The primary management control is enforcing a limit on the number of fishers who are authorised to operate. The EMBA overlaps with the Lower South Coast region which had 14 active businesses in the 2019-2020 season, however there was no reported catch within the EMBA between 2016-2021 (DPI 2022b; DPI 2023 (personal communication, 21 April 2023)).

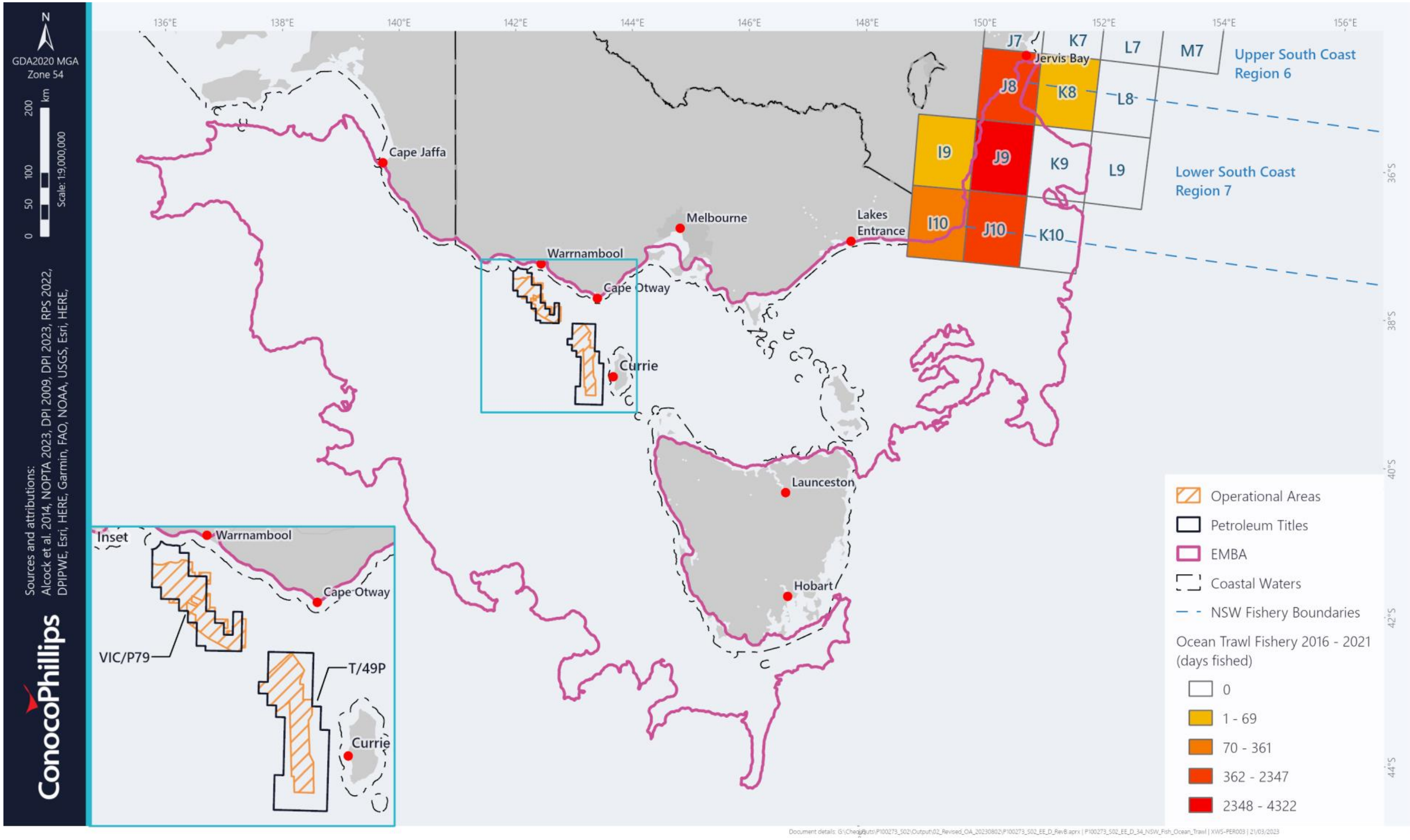


Figure 4-98: NSW Ocean Trawl Fishery within the EMBA

4.7.10.7. Development Commercial Fishery

The Development Commercial fishery was established to allow for exploration of new fishery options. There have been instances where individuals or groups have expressed an interest in exploring opportunities to harvest marine resources, they perceive to be under-utilised in NSW waters, or use unique fishing methods not currently authorised. The State may allow for an application to be logged with the NSW Department of Primary Industries where the department may determine if a particular developmental fishery is likely to bring considerable benefit to the State and whether it warrants the investment of resources (DPI 2019c). Currently there are 5 applications being assessed undertake developmental commercial fishing activities by the department and no new applications are being accepted (DPI 2019c)

4.7.10.8. Sea Urchin and Turban Shell Restricted Fishery

The NSW Sea Urchin and Turban Shell restricted fishery is relatively small with few divers participating and 37 fishing businesses holding endorsements. All harvesting is done manually and most commercial fishers will dive for species using surface supplied compressed air (hookah). Harvesting occurs throughout the year however restrictions and closures may apply for individual species. During the 2019-2020 season 126 t was caught and valued at $0.5 million (DPI 2022b). The fishery is managed by regional catch limits which were set at 30 t total for the 2023 fishing period (DPI 2019c). The EMBA overlaps with 3 of the 5 sea urchin and turban shell regions (Figure 4-99). Indicators for the Sea Urchin & Turban Shell fishery are reported at the state level only due to the small number of active fishers. Between 2016-2021 a total of 543.1 t was landed within the EMBA (DPI 2023 (personal communication, 21 April 2023)).

4.7.10.9. Southern Fish Trawl

The NSW Southern Fish Trawl Fishery was located within the coastal waters of NSW and spanned between Sydney and the Victoria-NSW border (Figure 4-100). This restricted fishery once fell under the jurisdiction of the Ocean Trawl Fishery and was managed under the fish trawl sector. In 2019 the Southern Fish Trawl Fishery was integrated into the Commonwealth Southern and Eastern Scalefish and Shark Fishery (SESSF) due to the substantial overlap between the two fisheries (DPI 2018b). This change was implemented in hopes that that joint management of fish stocks would removing duplication and administrative burden for operators currently operating across the two fisheries. Between 2016-2021 a total of 1,160.7 t was landed within the EMBA (DPI 2023 (personal communication, 21 April 2023)).

4.7.10.10.S37 Permit

In NSW miscellaneous permits are managed under Section 37 which includes permits like marine vegetation collection, aquarium collection, imports, scientific collection and oyster collection. These section permits are required for any activity that involves taking or possessing fish or marine vegetation that would otherwise be unlawful under the *Fisheries Management Act 1994* (DPI 2017). Applications require an environmental assessment and the inclusion of the appropriate fee. Between 2016-2021 a total of 572.7 t was landed within the EMBA (DPI 2023 (personal communication, 21 April 2023)).

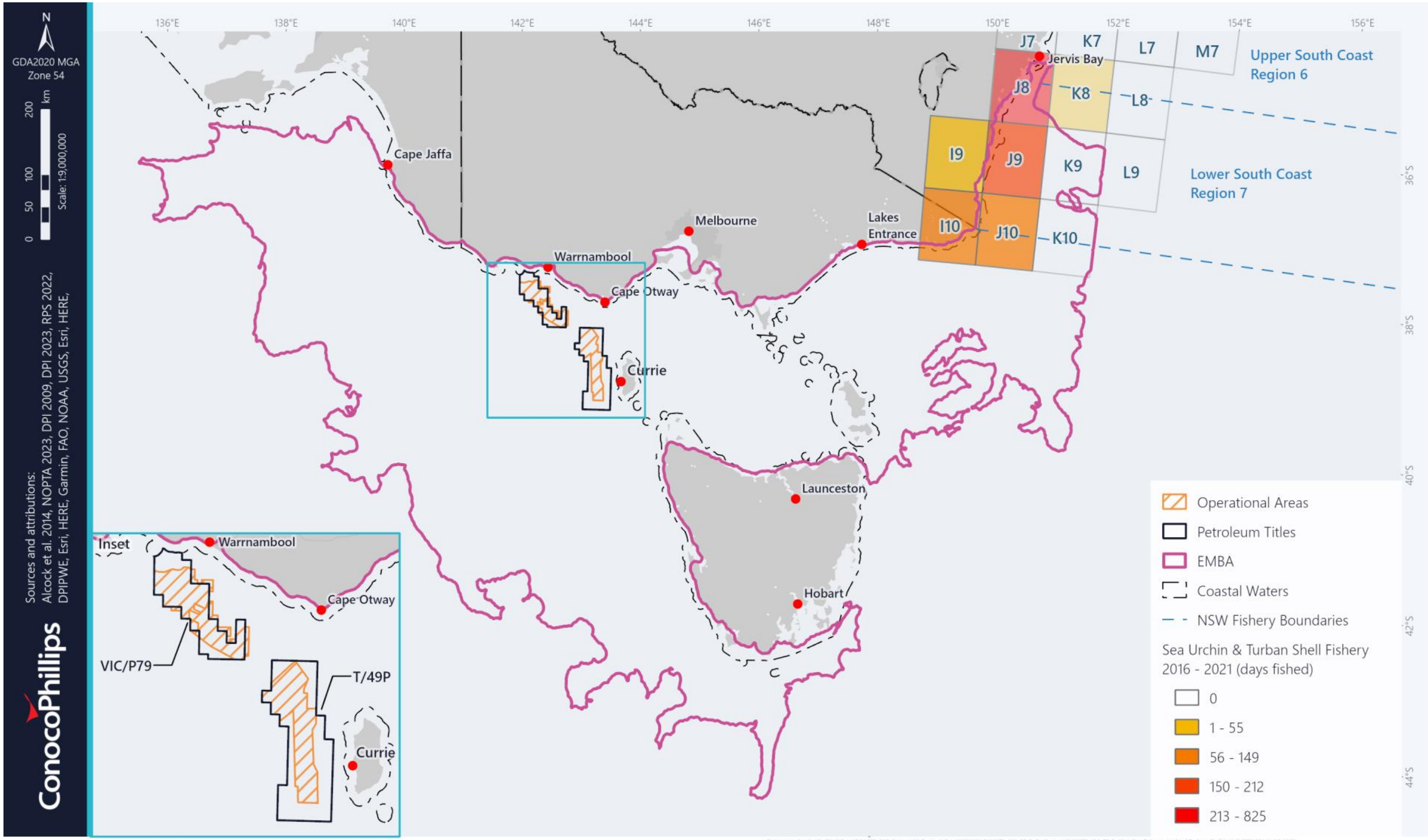


Figure 4-99: NSW Sea Urchin and Turban Shell Fishery within the EMBA

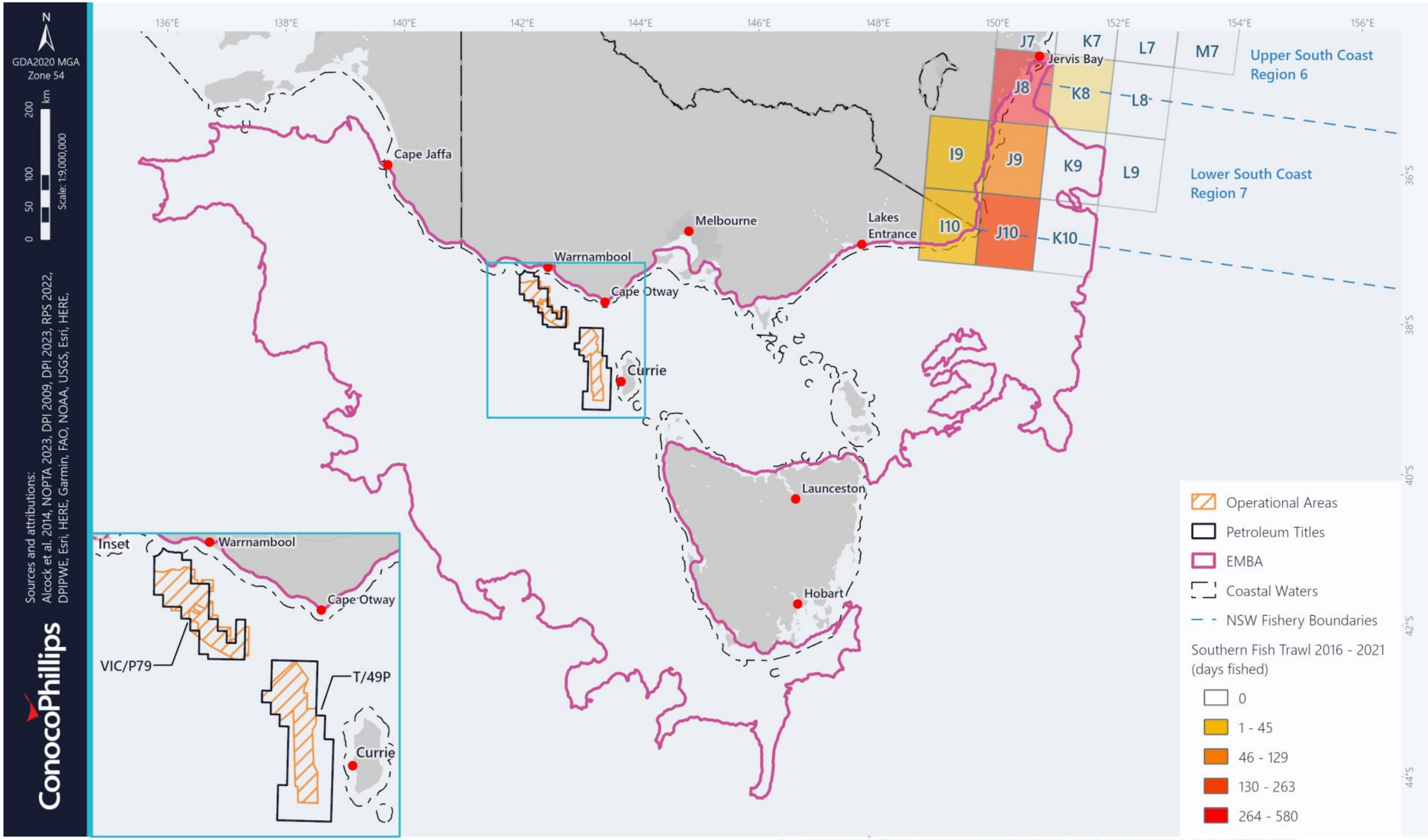


Figure 4-100: NSW Southern Fish Trawl Fishery within the EMBA

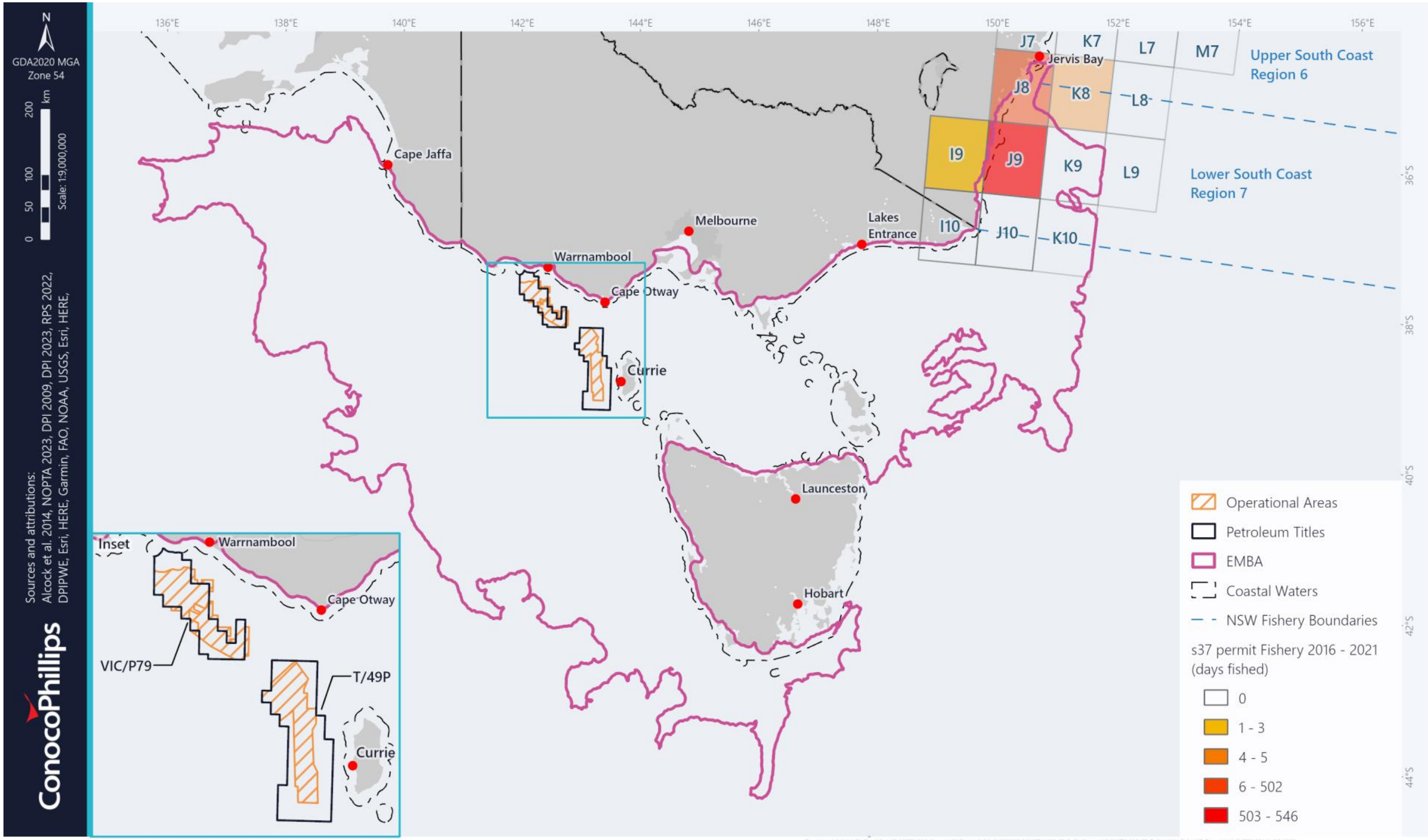


Figure 4-101: NSW s37 Permit within the EMBA

4.8. Cultural Environment

4.8.1. Maritime Archaeological Heritage

The Underwater Cultural Heritage Act 2018 (Cth) provides for the protection of Australia's shipwrecks, sunken aircraft and other types of underwater cultural heritage including Australia's Aboriginal and Torres Strait Islander underwater cultural heritage in Commonwealth waters.

Shipwrecks over 75 years old are protected within Commonwealth waters under the Act, in Victorian waters under the Victorian Heritage Act 1995 (Vic), in Tasmanian waters under the Historic Cultural Heritage Act 1995 (Tas), in South Australian waters under the Historic Shipwrecks Act 1981 (SA) and in New South Wales waters under the Heritage Act 1977 (NSW). The southern coast of Australia has been the main maritime thoroughfare for settlers, convicts, immigrants and traders since the earliest times of European settlement and continues to be through to the present day (Mitchell, 2023). The Victorian coastline is of particular significance and the long stretch between Moonlight Head and Port Fairy has earned a reputation for its treacherous waters and rugged coastline and is now deemed 'Shipwreck coast' (Mitchell, 2023).

A search of the Australasian Cultural Heritage Database (DCCEEW 2023) found hundreds of wrecks both historic (>75 years old) and non (< 75 years old) within the EMBA. Most identified wrecks occur in shallow waters on reefs or bays along the coast of King Island and Victoria or on beaches in exposed coastal islands. During consultation it was identified that, although no wrecks are identified within the operational areas (Figure 4-102), it is considered possible that unidentified shipwrecks may be present. A desktop maritime heritage assessment commissioned by ConocoPhillips Australia supported this statement and was able to identify one potential shipwreck that has a known presence in the vicinity of the study area:

- The SS Seljie (1929) - has several coordinates listed for its location, the closest of which is 6 km east of the VICP/79 operational area (Mitchell, 2023).

Further, of the hundreds of shipwrecks thought to occur within the EMBA, only 12 were identified to potentially be located within the vicinity of the operational areas as the current location of these wrecks are known only from the historical record and have not been located (see Appendix O for further detail).

. Additionally, the closest identified sunken aircraft to the operational areas is Twin Engine located near Lady Julia Percy Island, Victoria; however limited data is available on the history of the event (DCCEEW 2023) and it is considered possible that other aircraft may be present. It is also understood through consultation that many of the positions provided in the database, including those near the operational areas, are not the known position of a shipwreck but are actually the centre point of an area that an unfound shipwreck may be located based off historic records of loss, and the further offshore typically the larger the area of loss may be, meaning that there may be many shipwrecks, and other artefacts, located within the operational area (Org ID: 35, Department of Energy Environment and Climate Action, Event ID: 3242, FB ID: 273, 274). This statement was supported by the desktop maritime heritage assessment which states that the accuracy of the information detailing wreck locations, and the coordinates assigned to specific wrecks in heritage databases, varies from case to case (see Appendix O). Further, it is important to note that an additional unknown number of shipwrecks may occur within the operational areas (Mitchell, 2023). These could be vessels not accounted for in the local historical sources, vessels not listed on the insurance registers, or small coastal craft.

Significant shipwrecks along the coast of King Island form part of the King Island Maritime Trail (Shipwrecks and Safe Havens) and include those mentioned below:

- Blencathra (1875)
- British Admiral (1874)
- Carnarvon Bay (1910)
- Cataraqui (1845)
- Loch Leven (1871)
- Netherby (1866)

- Neva (1935)
- Sea Elephant Bay (1802)
- Shannon (1906).

Significant shipwrecks along Victoria's 'Shipwreck coast' include:

- Loch Ard (1878)
- SS Schomberg (1855)
- Josheph H. Scammell (1891)
- Falls of Halladale (1908).

In addition to the general protection provided by the *Underwater Cultural Heritage Act 2018* there are a number of shipwrecks within Australia which have established protected zones (DCCEEW 2021d). Zones may be established for a number of reasons including conservation, management or public safety considerations. Within the EMBA there are 4 shipwrecks with established protection zones which including, the SS Glenelg (1900) – 500 m radius, the SS Federal (1901) – 800 m radius, the Clonmel (1841) – 50 m radius and the SS Alert (1893) – 500 m radius.

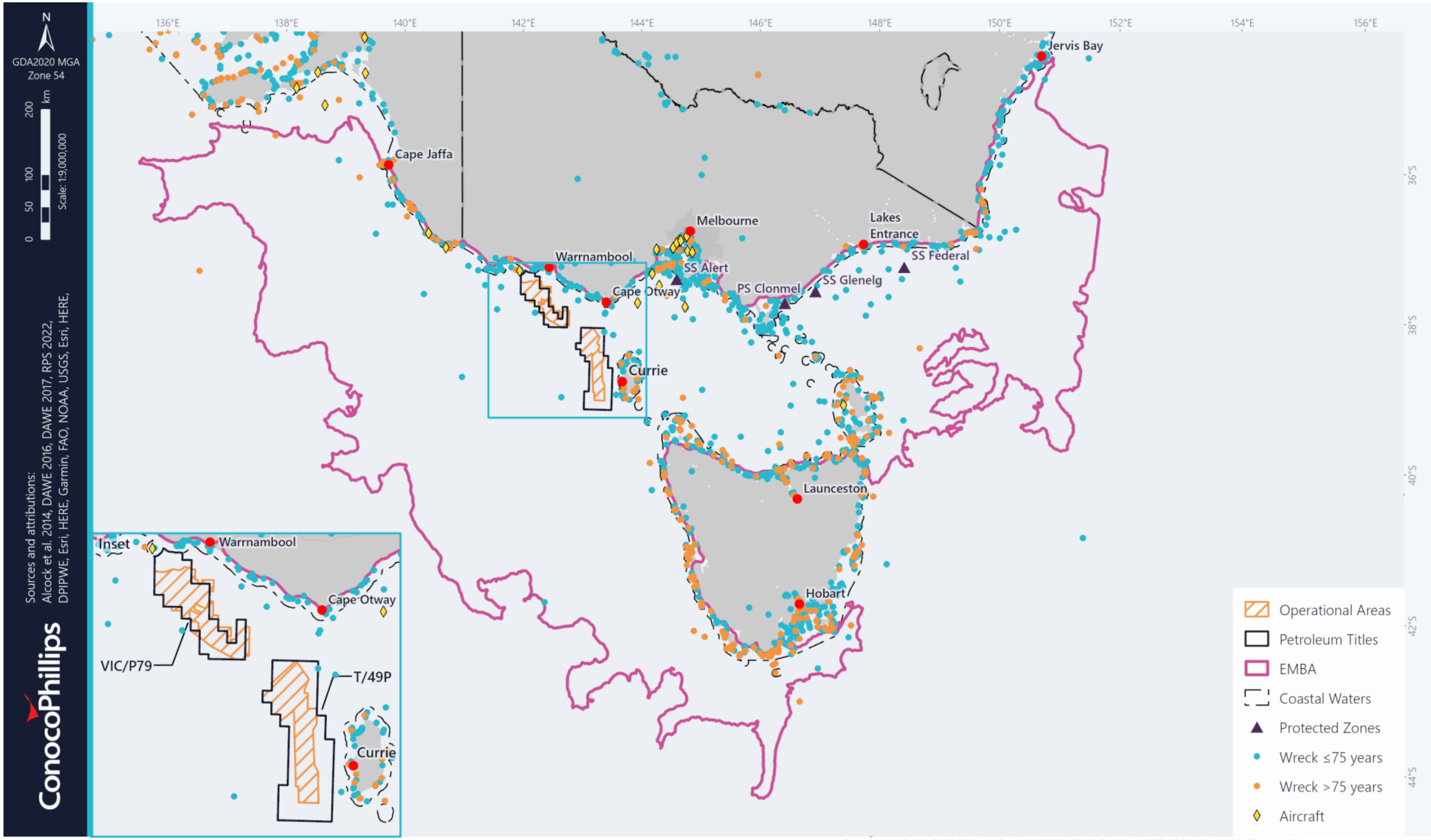


Figure 4-102: Identified historic wrecks within the EMBA

4.8.2. First Nations Heritage

ConocoPhillips Australia commissioned a cultural heritage specialist (Biosis) to explore regional cultural heritage and cultural heritage landscapes to support a grounding in Aboriginal cultural heritage including Country and Sea Country. The intent of the commissioned study, included in Appendix L, was to form the basis for gaining an understanding of cultural values and sensitivities, to inform consultation and support the preparation of the Environment Plan.

The Otway Exploration Drilling Program is located within western Bass Strait which is the marine environment between mainland Australia and Tasmania. Bass Strait was formed during the last glacial period, between 110,000 and 12,000 years ago. At this time, the Earth's climate was much cooler and global sea levels were much lower due to the large amount of water that was locked up in glaciers and ice sheets (Biosis 2023). At this time a land bridge connected mainland Australia and Tasmania (Figure 4-103), however as the climate began to warm the sea levels rose and, in the process, gradually flooded the bridge connecting the two landforms. This gradual flooding is known to have occurred during a time of human inhabitation in the region as there is known movement of First Nations peoples between Victoria and Tasmania. First Nations peoples have passed on dreaming stories of both Victorian and Tasmanian First Nations communities which reinforce the memories and song lines relating to the flooding and connection to Sea Country of coastal communities (Biosis 2023).

Sea Country, like Country, is of First Nations cultural heritage significance. First Nations peoples make no distinction between the land and sea as they believe Sea Country is determined by the travels of Dreaming ancestors (Kearney, A; O'Leary, M; Platten, S. 2022) and their rights and responsibilities to the earth aren't bound by any one element. This connection extends far beyond the current shoreline out to the edge of the continental shelf. Although this area is now submerged, it had been occupied for thousands of years and the rising sea levels have not washed away the history, physical evidence or connection (Biosis 2023). [Paragraph updated in response to Matters: FN01, FN04, FN05].

First Nations people have an ongoing and intimate relationship with coastal and marine environments, which is based on a long tradition of ownership, stewardship, utilisation and cultural significance. For Indigenous peoples, their cultural values are intertwined around traditional uses, spiritual connection, ancestral ties and respect for the land and sea, and the resources they provide (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation 2004).

The South-east Regional Marine Plan Assessment Report titled 'Sea Country – an Indigenous perspective', states 'As on land, saltwater country contained evidence of the Dreamtime events by which all geographic features, animals, plants and people were created. It contained sacred sites, often related to these creation events, and it contained tracks, or Songlines along which mythological beings travelled during the Dreamtime. The sea, like the land, was integral to the identity of each clan, and clan members had a kin relationship to the important marine animals, plants, tides and currents.' In addition, 'Indigenous peoples still relate to land that was inundated by sea during the last ice age and regard it as their own.'

Plants and animals are totems for First Nations people. First Nations people share the land with them and their relationship is fundamental to the continued practice, and cultural responsibility – for food, health, shelter, cultural expression and spiritual wellbeing. Caring for plants, animals and their habitats is therefore seen as a keyway of expressing culture. Indigenous ecological knowledge of Country, including knowledge of plants and animals, has sustained life and been passed on by First Nations people for tens of thousands of years.

Currently the majority of First Nations peoples live around the region in major cities, regional centres, small towns and on Indigenous land. However, we know that historically many have been displaced from the coastal areas where their clans or tribes once lived as the coastal areas of South-east Australia were amongst the most densely populated regions of pre-colonial Australia (NOO 2002b). These coastal areas provided First Nations peoples with an abundance of resources that were not available away from the coastal and marine environment. For example, coastal fishing and hunting for fish, shellfish, seals and mutton birds formed an important part of the diet of Aboriginal peoples (DoE 2015b). Shellfish, crustaceans in particular, held definite importance which is apparent in the numerous locations of shell middens (i.e. the remains of shellfish, such as mussels, pipi or oysters, eaten by First Nations people) along coastline of the study area. There are thousands of documented First Nations places within the study area coastlines in the form of coastal shell middens and other sacred sites, places and artefacts along the coast within sheltered positions in the dunes, coastal scrub and woodlands which are clear reminders of this reliance (Biosis 2023).

Relevant persons provided feedback regarding the protection of First Nations cultural heritage features (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 34, Department of Premier and Cabinet Office (TAS), Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 597, Event ID: 1144, FB ID: 33).

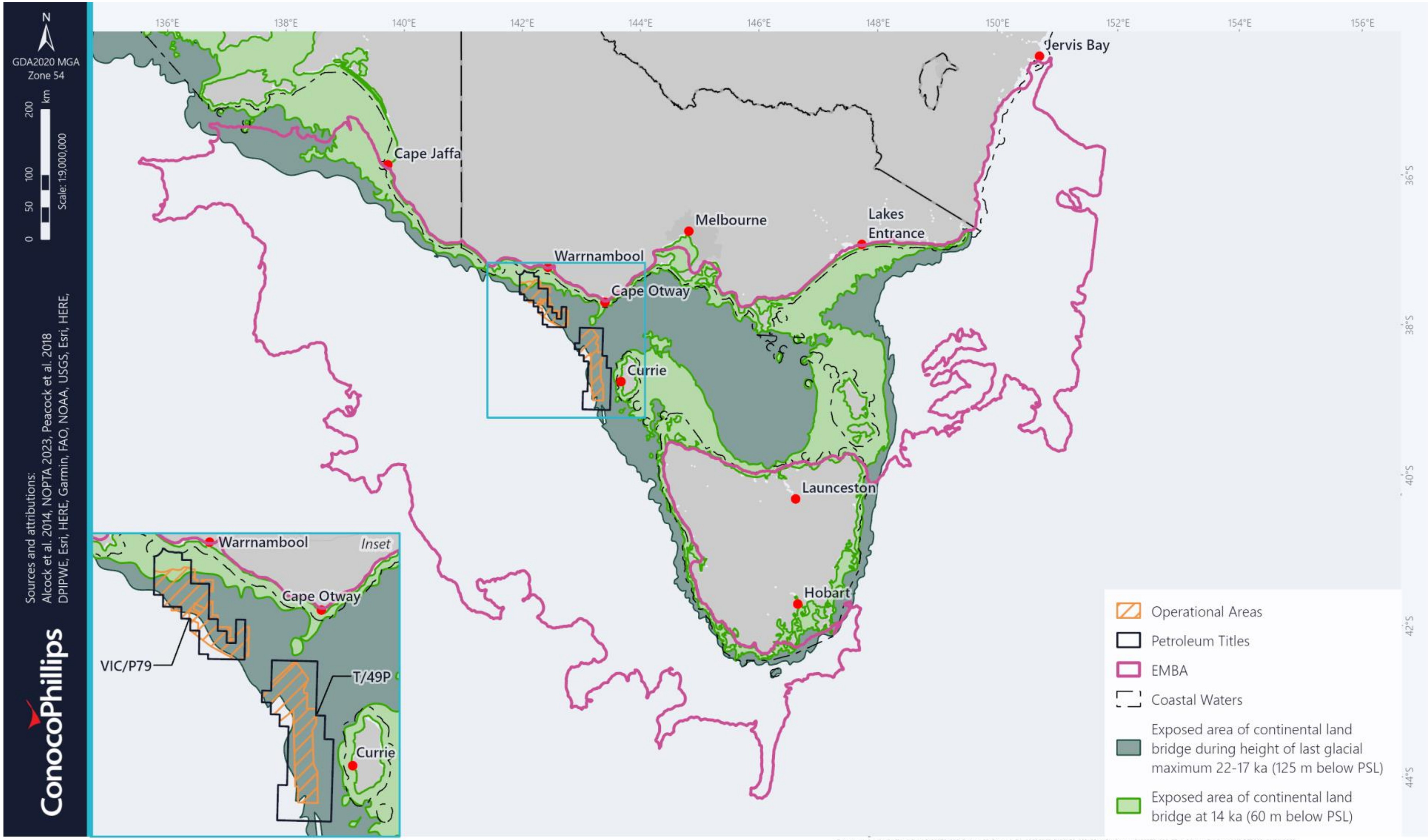


Figure 4-103: Exposed area of continental land bridge between Tasmania and mainland Australia at 27-17 ka and 14 ka

4.8.2.1. Tasmania

First Nations peoples have inhabited Tasmania throughout the Last Glacial Maximum, back to 35,000 years before present (Jones et al 2023). Tasmanian Aboriginal people were able to survive the changing landscape due to their knowledge of resources provided by the marine and coastal environments and their ability to harvest aquatic resources, such as seals and shellfish. The Tasmanian Aboriginal people, including the Palawa people and the Pirapa people (names by which some Tasmanian Aboriginal people refer to themselves), stayed entirely isolated from the rest of the human race for approximately 10,000 years until the French made contact in 1772 (National Museum of Australia, September 2022). The information presented in this section of the EP has been updated to reflect feedback received during consultation (Org ID: 34, Department of Premier and Cabinet Office (TAS), Org ID: 92, Event ID: 3818, Reg16b IDs: 402-409; Org ID: 54, Event ID: 4215).

It is estimated that the population of Tasmania at the time of European colonisation was approximately 3,000 – 8,000. Prior to European colonisation, the Tasmanian Aboriginal People had a rich socio-dialectical groups based around clan or family ties based on shared common language and economic and social interests. These larger amalgamations are referred to as Nations by early ethnographer George Robinson.

The first permanent settlement occurred at Risdon Cove in 1803 close to present day Hobart. From 1807 to 1813, incoming settlers from Norfolk Island began to settle the south-east coast which led to direct confrontation with the Oyster Bay Nation. Early European settlement in Tasmania struggled with reliable food supplies and Europeans were often in direct competition with Aboriginal hunters for meat.

With the removal of the Tasmanians to Flinders Island by George Augustus Robinson the population of the Tasmanian Aboriginal people decreases. When the Tasmanian Aboriginal people returned to the mainland to Oyster Cove, many of these survivors were not allowed back into their traditional areas where they were born, or where their family had resided for generations.

The Aboriginal Heritage Register lists over 13,000 sites across Tasmania and contains details of the most recent and accurate data of First Nations heritage places and objects which are of significance to the Tasmanian Aboriginal people. The register is not publicly accessible in order to protect culturally sensitive information however various studies were conducted between 1980-1990 to more broadly understand Tasmanian First Nations land use. Broad findings of these studies are detailed below:

- North / North East Tasmania
- Sites generally occur on high energy coastlines with approximately 78% residing within 50 m of a water source
- Sand dune areas most commonly have sites located on them
- Rock art can be found pecked in stone on coastal margins (Biosis 2023).
- North West/ West/ South West
- Majority of sites can be found on sand dunes close to rock platforms and include artefact scatters, isolated artefacts, stone and ochre quarry sites and rock shelters
- Middens are generally smaller and lower on sandy shores and absent along rocky granite shorelines
- Areas within 500 m of major water courses and creeks will generally contain First Nations sites
- Hut depressions occur on coastal margins, generally close to food sources
- Generally, sites are 70 to 100 artefacts per km^2. Densities are approximately 1.7 artefacts per site in places away from major rivers and quarry sites, whereas there will be approximately 6.5 artefacts per site in areas close to these resources (Biosis 2023).

During consultation it was identified that coastal areas continue to be important to the Tasmanian Aboriginal people for seasonal licensed commercial and recreational harvesting of mutton bird, other traditional shellfish harvesting, connection to country and traditional cultural practices (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346).

King Island

First Nations heritage sites on King Island typically contain low density stone artefact scatters with isolated midden finds. These sites are mostly located in close proximity to freshwater sources, particularly freshwater lagoons found in numerous locations on the island (Sim 1991). Stone artefacts have been recorded on the island along southwestern coastal cliffs, at the Petrified Forest and elsewhere on the island in different dune formations. However, there is less visibility of First Nations heritage in coastal areas as the west and south-west coast has been inundated by dune formation with middens (shellfish and bones) only exposed through dune blowouts (Sim 1991). Information pertaining to specific locations where First Nations heritage has been observed has been included in the Sensitive Information Report (Appendix D), provided to NOPSEMA, but has been removed from this section of the EP in response to feedback received during consultation (Org ID: 34, Department of Premier and Cabinet Office (TAS), Org ID: 92, Event ID: 3818, FB ID: 408).

Indigenous Protected Areas

The EMBA overlaps a number of Indigenous Protected Areas including the following:

- The Preminghana IPA, covering 524 hectares of land in the north-west to protect historic Aboriginal engraving sites and the endangered Preminghana daisy, was dedicated in 1999.
- The Babel Island IPA, located to the east of Flinders Island, is Australia's largest mutton bird rookery and an important cultural resource for Tasmanian Aboriginal people. The 441-hectare island was dedicated in 2009.
- The Badger Island IPA and its surrounding resources previously supported a community of Tasmanian Aboriginal people. No longer inhabited, the 1,244-hectare island was dedicated in 2000.
- The lungatalanana (Clarke Island) IPA, at 8,159 hectares, is the third largest of the Furneaux islands. It has strong links to the Tasmanian Aboriginal community and was dedicated in 2009.
- Mount Chappell Island was dedicated as an IPA in 2000. The 327-hectare island also has important links to the Tasmanian Aboriginal community. Tasmanian Aboriginal Centre Rangers work to protect the island's mutton bird rookeries and to maintain existing buildings on the island so that community members have a place to stay.
- Big Dog Island, to the south of Flinders Island, was dedicated as an IPA in 2009. It remains an important mutton-birding island for Aboriginal people.

The tayaritja Healthy Country Plan (Tasmanian Aboriginal Council 2020) provides additional information on lungatalanana, Babel Island, Big Dog Island and Badger Island.

4.8.2.2. Victoria

In Victoria, Traditional Owner groups are represented by the relevant Registered Aboriginal Party (RAP). There are 5 RAPs registered in the study area, including the Gunditjmara, Eastern Maar, Wadawurrung, Bunurong, and Gunaikurnai.

A search of the Victorian Aboriginal Heritage Register was undertaken by Biosis on the 21 December 2022. The search identified 5636 recorded Aboriginal places within the EMBA (Biosis 2023). The dominant Aboriginal places located in the study area are shell middens (46.82%), artefact scatters (39.21%) and low density artefact distribution (LDADs) (5.70%). Further, within the EMBA, the Traditional Owner group with the most registered Aboriginal places is Bunurong with 1486 place registrations (26.37%).

Gunditjmara

The Gunditjmara RAP group covers the area boarding the South Australia border with Victoria and the Southern Grampians. This area includes many state and national parks such as Discovery Coastal Park, Mount Richmond National Park, Cape Nelson State Park and the Grampians National Park (Biosis 2023). There are many landscapes within Gunditjmara Country including Nyamat Mirring (Sea Country) as it is noted that the Gunditjmara view water as part of their traditional lands and believe it should be recognised and protected as such. Significant locations of conflict are located on the coast and include the massacre of Gunditjmara at

Convincing Ground, east of Portland. The Convincing Ground Massacre occurred at Allestree, approximately 10km from Portland, where Gundtij Mara people were killed by whalers over a disagreement about the ownership of a beached whale (Biosis 2023).

Southern right whales, or ‘koontapool’, are recognised by First Nations people as Gunditjmara Ancestors. The areas identified as biologically important areas for southern right whales are also recognised by the Gunditjmara as sacred birthing areas. These ‘Koontapool Woorrkngan Yakeen’ - Whale Birthing Dreaming Sites, located in specific bays east of the Hopkins River, Victoria, and back east along the coast, are known resting and feeding sites for southern right whales; safe havens for mothers and babies (DCCEEW 2022). These places on Country are directly related to ‘Gunditjmara Neeyn’ (midwives) (DCCEEW 2022). Every year, locals gathered on Gunditjmara Sea Country for the first public welcoming of koontapool back to her traditional birthing waters.

Eastern Maar

The Eastern Maar RAP group covers the area between Port Fairy and Warrnambool, down to Apollo Bay, east to Lorne and north-west towards Ararat. Further, it extends 100 meters off the coast and encompasses the Twelve Apostles. Eastern Maar is an umbrella term, used to describe a large area of land containing many, smaller traditional owner groups, such as Maar, Eastern Gunditgimara, Tjap Wurrung, Peek Whurrong, Kirraw Whurrung, Kuurn Kopan Noot, Yarro waetch and many others (Biosis 2023). Eastern Maar’s connection to water relies heavily in the marine resources abundant around the area. Historic fishing practices are used to this day with the fishing and collection of eels, perch, blackfish, yabbies, abalone, cockles and crayfish. The Indigenous people of the region relied heavily on eels and established permanent communities based on both hunting and trapping eels in rock traps associated with their houses (NOO 2002b). Further, they believe that the spirits of their dead reside in the waterways and waterbodies and value them as a way to connect with their ancestors (Biosis 2023).

Wadawurrung

The Wadawurrung held land along the coast from Painkalac Creek at Aireys Inlet, east into Port Phillip Bay and to the Werribee River and to the north as far as Mt Emu and Fiery Creeks. Little is known about the Wadawurrung and their social organisation as they were one of the first First Nations groups within the region to be affected by European settlement in the area (Biosis 2023).

Bunurong

The Boon Wurrung language group, commonly associated with the Bunurong people occupied the coastal area from the Werribee River to Anderson Inlet, Phillip Island and probably beyond to Wilsons Promontory. The Bunurong RAP group covers the Mornington Peninsula, Western Port and the eastern most part of South Gippsland (Biosis 2023). The Bunurong group is loosely divided into smaller clan or family groups, named for the area they associated with. The use of water-based resources is evident in the quantity of shell midden sites found along the coastline. Within the study area and the bounds of the Bunurong RAP group, there are a total of 677 registered shell midden sites, within 200 m of the shoreline (Biosis 2023). This suggests knowledgeable exploitation of marine resources as practiced techniques and an understanding of the ocean would be needed to accumulate the amount of shell middens listed on Bunurong country.

Gunaikurnai

The Gunaikurnai RAP group covers most of the Gippsland Area, spanning from Warragul and Noojee, down to Port Albert and Port Welshpool, eastward towards Bairnsdale, Lakes Entrance and Marlo, and north towards Omeo and Hotham Heights. The Gunaikurnai people see the land, water, air and every living thing as one. All things come from these elements and therefore they are seen as the spiritual life-giving resources which provide us with resources and form the basis of cultural practices (GLaWAC 2022a).

Indigenous Protected Areas

The EMBA overlaps the Deen Maar Indigenous Protected Area (IPA) dedicated in 1999. This IPA covers 453 hectares of rolling sand dunes, limestone ridges, a river, lake and wetlands and is located on the south-west coast of Victoria near the town of Yambuk. For many thousands of years Deen Maar was part of the homelands of the Peek Whurrong speakers of the Dhauwwurdwurung (Gundidjmara) Nation. Evidence of their occupation is scattered across Deen Maar, from shell middens to Indigenous wells for water collection and food storage. Deen Maar Island (Lady Julie Percy Island) has a strong spiritual and visual connection with the Traditional Owners as the place where Bunjil, the Creator, left this world.

The EMBA overlaps the Gunditjmara Sea Country Indigenous Protected Area (IPA) Consultation Area (Gunditj Mirring Traditional Owners Aboriginal Corporation with Eastern Maar Aboriginal Corporation). The consultation project aims to support Indigenous-led consultation with Traditional Owners and other stakeholders, management planning, and on-sea/on-land management. The IPA consultation area is located in south-west Victoria from the Convincing Ground in the west to Yambuk Lakes in the east. The area includes volcanic plains, rivers, coast, estuaries and coastal wetlands, and is an important breeding place and nursery for fish, kooyang (short-finned eel – *Anguilla australis*) and birds, including nationally listed species. The area's waters encompass sites of national geological and geomorphological importance, and habitat for threatened marine animal species. The area also incorporates important cultural sites such as Deen Maar Island, which has a central role in the creation story of Gunditjmara Country (Org ID: 597, Event ID: 1144, FB ID: 33). The project will allow Traditional Owners to further protect the Budj Bim Cultural Landscape, a National and World Heritage Listed property located in the traditional Country of the Gunditjmara people in south-eastern Australia. Project activities will include implementation of on land/sea management activities, community employment and capacity building, sharing and documentation of traditional knowledge, and the development and enhancement of regional partnerships.

The EMBA overlaps the Nanjit to Mallacoota Sea Country IPA Consultation Area (Gurnaikurnai Land and Waters Aboriginal Corporation), in coastal waters of the Gippsland region in Victoria. The area comprises numerous marine and coastal parks and includes the Ramsar listed Gippsland Lakes and Raymond Island, a highly significant cultural site. A Junior Sea Country Ranger program will bring young Traditional Owners to work with and learn from senior rangers and Elders. IPA staff will participate in a Mulloway monitoring program to learn migratory patterns and health condition of this culturally important fish species, as well as undertake research to identify opportunities to protect and enhance habitat for Australian bass and estuary perch. Gurnaikurnai Land and Waters Aboriginal Corporation will continue to identify and map land-based sites of cultural significance, building on the historical accounts of First Nations People in the region.

4.8.2.3. South Australia

The Buandig people are the Traditional Owners of the South east region of South Australia. Their country, which they have lived in for at least 50,000 years, includes the coastal area from the south of Robe to the mouth of the Glenelg River at Nelson, Victoria. They lived near sandy beaches and tidal estuaries relying on the coastal and marine environment for resources with shellfish being of particular importance. The South Australia Aboriginal Sites and Objects Information Management System contains details of First Nations cultural heritage places and objects within the state. However, the register is not publicly accessible in order to protect culturally sensitive information and therefore we are unable to identify any sites within the EMBA.

4.8.2.4. New South Wales (NSW)

The Yuin Nation are the Traditional Owners of the southern NSW coastal region. Yuin is the generic name for the different groups who occupied the land from Cape Howe to Shoalhaven Rivers and inland to the Great Dividing Range. Collectively the clans are referred to as Yuin Nation. They lived off and relied upon the rich abundance of food around the lakes, waterways and ocean. Most of the landscape is connected with story lines and ceremony and is evident in the land and often described as some of the first noticeable landmarks from sea by European settlers. NSW has an online Aboriginal Heritage Information Management System which contains details of over 100,000 recorded Aboriginal sites and over 14,000 archaeological and cultural heritage assessment reports. However, the register is not publicly accessible in order to protect culturally sensitive information and therefore we are unable to identify any sites within the EMBA.

4.8.3. Native Title

The *Native Title Act 1993* (Cth) is a law that was passed by the Australian Parliament which recognises the rights and interests of Aboriginal and Torres Strait Islander people in land and waters according to their traditional laws and customs (Figure 4-104).

4.8.3.1. Tasmania

There are currently no registered native title claims in Tasmania (NNTT 2022).

4.8.3.2. Victoria

In 2007 a native title was granted when the state recognised the Gunditjmara people as the Traditional Owners of the land in parts of the determination area over the western district of Victoria (1,426 km^2). The area is bounded by Glenelg River to the west and Shaw River to the east and includes Lady Julia Percy Island and the coastal foreshore between the South Australian border and the township of Yambuk (NNTT 2022).

In 2010 a native title was granted when the state recognised the Gunaikurnai people as the Traditional Owners of the land in parts of the determination area over the Gippsland region (13,842 km^2). The area extends from west Gippsland near Warragul and Inverloch east to the Snowy River and north to the Great Dividing Range (NNTT 2022). Further, this includes 200 m of Sea Country offshore. The state has entered into an agreement with the Gunaikurnai people under the *Traditional Owner Settlement Act* 2010. However, the agreement and the native title determination only affect undeveloped Crown land within the Gippsland region.

In 2011 a native title was granted when the state government recognised the Gunditjmara and the Eastern Maar people as the Traditional Owners of the land in parts of the determination area over the south western district of Victoria (42.6 km^2). The area is bounded by Eumeralla River on the west and extends to Shaw River on the east and includes Deen Maar Island and the coastal foreshore of the Parishes of Eumeralla and Tyrendarra (NNTT 2022).

In 2023 a native title was granted when the state government recognised the Eastern Maar people as the Traditional Owners of the land in the entire determination area over a south western region of Victoria (10,019 km^2). The Victorian coastline included within the determination extends from Cape Paton Lookout south to a point 100 metres seaward of the mean low water mark and west along the coast to the mouth of Hopkins River (NNTT 2022).

A claim exists from 2021 over the southern coast of Victoria (13,077 km^2), generally in the coastal district of Melbourne and including Wilson's Promontory by the Boonwurrung People (NNTT 2022). There is currently no registration or determination registered over the area of the claim (still active) in the National Native Title Register.

A claim exists from 2022 over the south coast of Victoria (13,844 km^2), generally the coastal district of Geelong and including a portion of Great Otway National Park by the Wadawurrung People (NNTT 2022). There is currently no registration or determination registered over the area of the claim (still active) in the National Native Title Register.

4.8.3.3. South Australia

A registered claim exists from 2017 over the south east coast (19,681 km^2) of South Australia near the Victorian border by the First Nations of the South East (NNTT 2022). There is currently no determination registered over the area of the claim (still active) in the National Native Title Register.

4.8.3.4. New South Wales (NSW)

A registered claim exists from 2017 over the south coast land and waters (16,808 km^2) of NSW by the South Coast People (NNTT 2022). There is currently no determination registered over the area of the claim (still active) in the National Native Title Register.

4.8.4. Indigenous Land Use Agreements

Indigenous Land Use Agreements (ILUAs) are voluntary agreements that are made between native title parties and other people or bodies regarding the use and management of areas of land and/or waters. ILUAs are legally binding and entered under the *Native Title Act 1993*. ILUAs located within the EMBA are detailed in sections below and displayed in Figure 4-104.

4.8.4.1. Tasmania

There are no ILUAs in Tasmania that have been accepted for registration (NNTT 2023).

4.8.4.2. Victoria

In 1999 an ILUA was registered south of Port Campbell National Park in the Two Mile Bay area. VIA1999/001 is an area agreement between BHP Petroleum Pty Ltd and the Framlingham Aboriginal Trust and the Kirrae Whurrong Native Title Group (NNTT 2023). The area of the Agreement comprises one pipe trench or corridor from the Minerva Gas Field onshore to a 30 m wide easement over the route that is followed through the land by a pipeline.

In 2007 an ILUA was registered which includes the coastline between the western Victorian border and approximately half of the Discovery Bay Coastal Park. VI2005/006 is an area agreement between Essential Petroleum Resources Limited and Gunditjmara Native Title Group (NNTT 2023). The area of the Agreement covers all the lands and waters subject to Onshore Exploration Permit Petroleum PEP 151.

In 2007 an ILUA was registered which includes the coastline between the western Victorian border east to the division line between the Shire of Glenleg and the Shire of Moyne, termed the Lake Condah Area. VI2006/004 is a body corporate agreement between the State of Victoria and Gunditj Mirring Traditional Owners Aboriginal Corporation on behalf of the Gunditjmara People (NNTT 2023). The area of the Agreement cover the land and waters identified in Schedule 2 of the approved determinations of native title made in proceedings VID6004/1998 (VC99/7 Gunditjmara) and VID655/2006 (VC06/1 Gunditjmara #2).

In 2010 an ILUA was registered which includes the coastline between the western Victorian border east to the division line between the Shire of Glenleg and the Shire of Moyne. VI2010/001 is a body corporate agreement between the State of Victoria and Gunditj Mirring Traditional Owners Aboriginal Corporation (NNTT 2023). Includes part of the settlement of proceedings VID6004/1998 and VID655/2006 in relation to Area A.

In 2011 an ILUA was registered which includes the coastline between Port Franklin and Marlo and encompasses a total area of (13,390 km^2). VI2010/003 is a body corporate agreement between the State of Victoria and Gunaikurnai Land and Waters Aboriginal Corporation (NNTT 2023). The Agreement covers parcels where Native Title has been determined to exist in the Gunai/Kurnai consent determination, October 2010, extending 200 m seaward of the territorial sea baseline in the south to the great dividing range in the north.

In 2013 an ILUA was registered which includes sections of the coastline between Port Albert and Lakes Entrance. VI2013/008 is a body corporate agreement between the Icon Energy and Gunaikurnai Land and Waters Aboriginal Corporation (NNTT 2023). The Agreement covers approximately 854 km^2 of VID6007/1998 Gunai/Kurnai Consent Determination where Native Title Exists within Petroleum Exploration Permits 170, 172 & 173.

In 2015 an ILUA was registered which includes the coastline between the western Victorian border east approximately ending around the Eumeralla River entrance and includes Lady Julia Percy Island. VI2015/002 is a body corporate agreement between South East Australia Gas Pty Ltd, Gunditj Mirring Traditional Owners Aboriginal Corporation and the Eastern Maar Aboriginal Corporation (NNTT 2023). The ILUA encompasses a total area of (1,371 km^2).

4.8.4.3. South Australia

There are no ILUAs in South Australia located within the EMBA that have been accepted for registration (NNTT 2023).

4.8.4.4. New South Wales

In 2002 an ILUA was registered near Eden along the southern coast of Twofold Bay between Edrom and the Davidson Whaling Station. NI2001/003 is an area agreement (38.77 km^2) between the Commonwealth and the NSW Aboriginal Land Council, Twofold Bay Native Title Group and Eden Local Aboriginal Council (NNTT 2023). The area of the Agreement covers four distinct areas, including the offshore wharf and related areas.

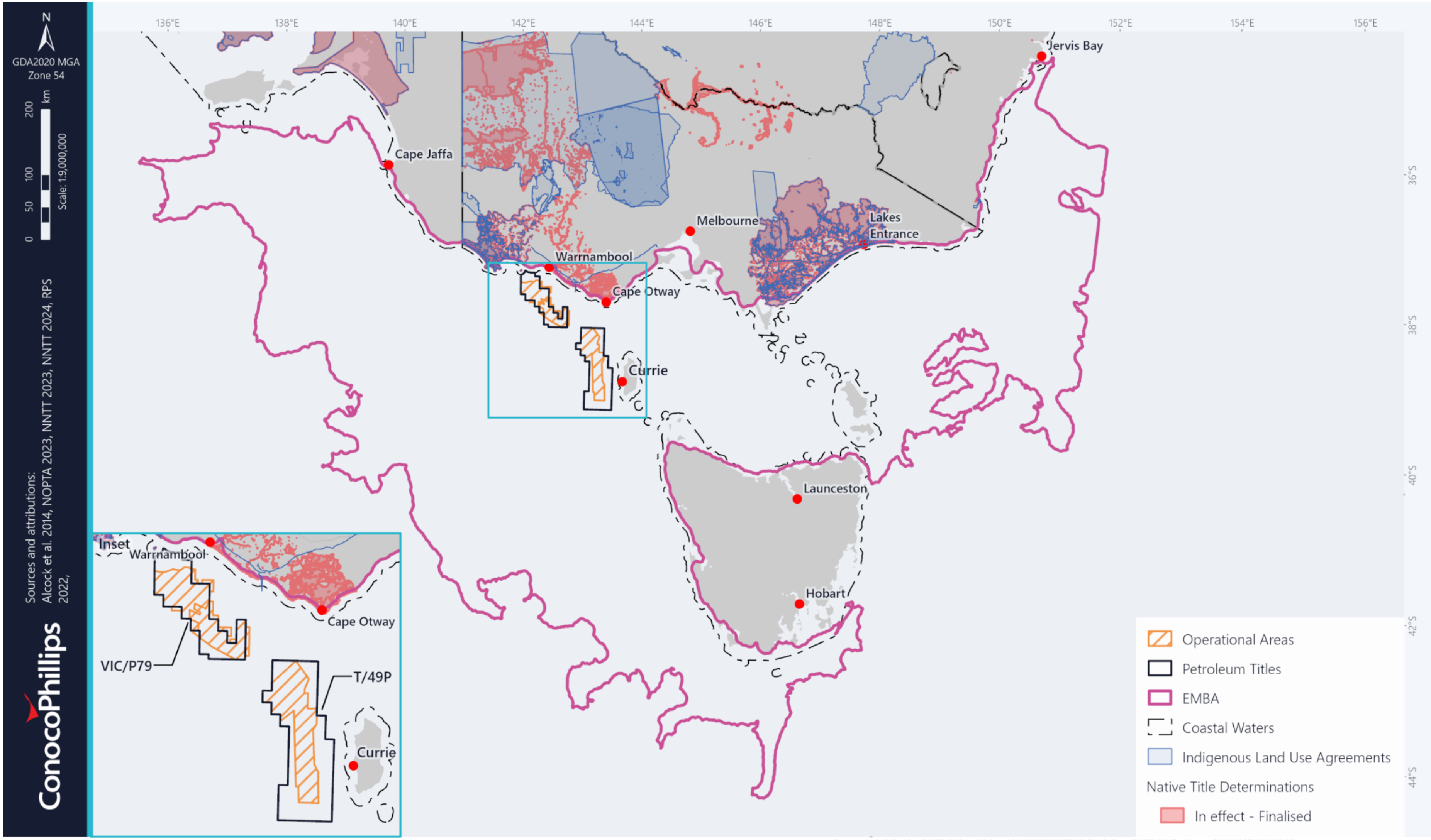


Figure 4-104: Native Title determinations and ILUAs within the EMBA

5. Environmental Impact and Risk Assessment Methodology

5.1. Introduction

Section 21(5) of the Environment Regulations requires the EP to detail all environmental impacts and risks from the activity, evaluate them, and detail control measures to reduce the impacts and risks of the activity to as low as reasonably practicable (ALARP) and acceptable levels. NOPSEMA's Environment Plan Content Requirements guidance note (N-04750-GN1344, September 2020) describes the considerations to be made when undertaking evaluation and treatment of impacts and risks.

The ConocoPhillips Australia environmental impact and risk assessment methodology provides a structured and comprehensive process for identifying, assessing and managing environmental impacts and risks associated with an offshore petroleum activity. The methodology aligns with ConocoPhillips Australia's Risk Management Procedure which is part of ConocoPhillips Australia's Health, Safety and Environmental Management System (HSEMS) (see Section 10). The methodology meets the requirements of the Environment Regulations and is consistent with:

- Australian and New Zealand Standard for Risk Management (AS/NZS ISO 31000:2018, Risk Management – Principles and Guidelines)
- AS/NZS ISO 14001:2016: Environmental Management System (EMS) – Requirements with guidance for use
- UK offshore oil and gas industry guidance on risk-related decision making (Oil & Gas UK, formerly UKOOA, 2014)
- NOPSEMAs Environment Plan Decision Making Guideline (N-04750-GL1721, December 2022), and
- NOPSEMAs Environment Plan Content Requirements Guidance Note (N-04750-GN1344, September 2020).

Definitions and terms used in the impact and risk assessment process are detailed in Table 1-1.

5.2. Communicate and Consult

In alignment with section 25(2) of the Environment Regulations, during the development of this Environment Plan (EP) ConocoPhillips Australia has consulted with relevant person(s) to obtain information in relation to their, functions, interests and activities (FIA) within the environmental planning area. This information has supported the development of a thorough understanding of potential impacts and risks to FIAs as a result of the proposed activities, and is used to inform the EP and the impact and risk assessments undertaken for the activity.

Consultation is an iterative process that continues throughout the development of the EP and for the duration of a petroleum activity as detailed in Section 3.

5.2.1. Preliminary Environmental Impact and Risk Assessment

Information developed during early assessment phases was collated and presented in the Preliminary Environmental Impact and Risk Assessment and Legislative and Other Requirements, released in April 2023 to support consultation. This included contextual information (Section 5.3), activity aspects, cause-effect pathways, identified impacts and risks (Section 5.4.1), and the preliminary analysis of impacts and risks (Section 5.4.2), as current at the time of publication.

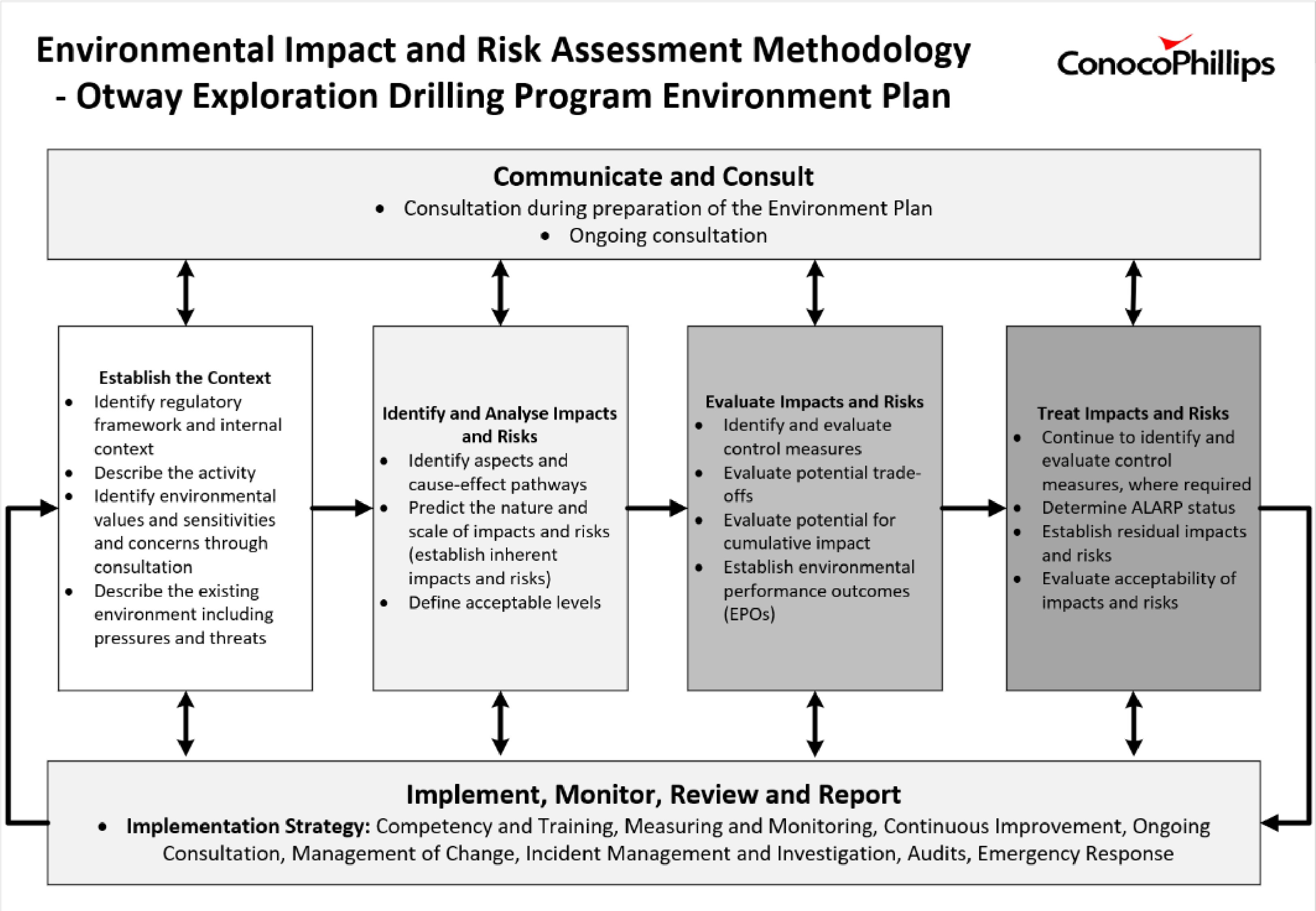


Figure 5-1: Environmental impact and risk assessment methodology (Adapted from NOPSEMA (2020))

5.3. Establish the Context

Context for impact and risk assessment is established by:

- Developing an understanding the regulatory framework within which the activity takes place, and any other requirements, to support framing of impact and risk assessments and the establishment of acceptable levels of impact and risk.
- Developing a detailed description of the activity to allow for the identification of planned and unplanned aspects that may cause impacts and create risks (Section 2).
- Inviting stakeholder feedback through consultation and incorporating feedback into the design of the activity where appropriate (Section 3), and
- Identifying environmental values and sensitivities to describe the existing environment in which the activity takes place, including the proposed operational areas and broader environmental planning area, in the context of existing condition and historical and current pressures (Section 4).

Where additional information about the existing environment was identified during consultation and resulted in a modification of EP content, the relevant consultation event is indicated by the Event ID and the specific feedback provided can be matched to the FB ID number.

5.4. Identify and Analyse Impacts and Risks

5.4.1. Identify Aspects and Pathways, and Impacts and Risks

An environmental workshop (ENVID) was conducted over two sessions in 2022 to identify environmental impacts and risks associated with the petroleum activity and included:

- Identifying planned aspects of the activities that could give rise to environmental impacts (e.g., underwater noise from drilling and vessel operations, emissions and discharges from the drilling rig and vessels, etc), and unplanned events that could pose an environmental risk if they occur (e.g., hydrocarbon spills from vessel collision, etc), (see Appendix A).
- Identifying mechanisms and cause-effect pathways by which environmental values and sensitivities (receptors) may be impacted, or put at risk, directly or indirectly by one or multiple aspects of the activity (see Appendix A).

ENVIDs were attended by environmental, approvals and drilling specialist consultants and ConocoPhillips personnel from Australia and corporate spanning well engineering, subsea and HSE disciplines.

Where additional hazards, pathways, impacts and risks were identified during consultation and resulted in modification of EP content, the relevant consultation event is indicated by the Event ID and the specific feedback provided can be matched to the FB ID number.

5.4.2. Identify Potentially Affected Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to this EP as per the EPBC Act and the Environment Regulations to be:

- presence of Listed threatened species and ecological communities
- presence of Listed migratory species (protected under international agreements)
- values and sensitivities as part of the Commonwealth marine environment
- values of World heritage properties
- values of National heritage places
- ecological character of a declared RAMSAR wetland
- other values include social, economic and cultural values.

As part of establishing the context of the receiving environment, consideration is given to environmental legislation and other requirements. This includes legislation defining how an activity should be undertaken (i.e. requirements for sewage discharges), legislation determining control measures to limit known impacts (such as accidental release legislation), and management plans, guidelines and conservation advices relating to the protection of threatened species or protected sites.

Where additional information about potentially affected receptors was identified during consultation and resulted in a modification of EP content, the relevant consultation event is indicated by the Event ID and the specific feedback provided can be matched to the FB ID number.

5.4.3. Analyse Impacts and Risks

Impacts from each planned aspect, and risks from credible unplanned events, were analysed to predict the nature and scale of each by:

- Reviewing scientific literature and undertaking modelling where required to identify the severity, extent and duration of each impact and risk, including defining the environment that may be affected (EMBA) where possible.
- Reviewing scientific literature and conservation management plans / recovery plans (Appendix A) to identify potential sensitive receptors and thresholds for different receptors, including critical life stages, to predict the severity of outcomes.
- Identifying any contributing factors such as existing condition, sensitivities, pressures/threats and possible causes, which may be linked to specific control measures at a later stage.

Using the ConocoPhillips Australia Risk Matrix, impacts and risks were assessed by following the steps below:

- Collated information from the above literature reviews and quantitative assessments was used to identify the maximum credible consequence arising from each impact and risk taking into consideration duration and extent, recovery time and predicted effects at an individual, population, ecosystem or industry level. Consequence descriptions are provided in Table 5-1.
- As planned aspects are expected to occur, the likelihood of their occurrence was not considered during evaluation, and only a consequence level was assigned.
- For unplanned events, the consequence level was combined with the likelihood of the event occurring, to determine an inherent risk ranking using the ConocoPhillips Australia Risk Matrix (Figure 5-2), which was updated in January 2024.

Inherent impact and risk predictions were made with legislative and other best practice requirements in place, which are assumed to be effective to the extent of their scope and application to the activity. They act as a minimum level of environmental management and control measures have been adopted to ensure that relevant legislative requirements are complied with.

Table 5-1: Consequence descriptions for impact and risk assessment

Rating	Environmental	Socio-economic and Cultural
5 Severe	High environmental impact. Release affecting impacting widespread areas including multiple receptors and/or environmental or culturally sensitive areas., fisheries, commercial users with potential for long-term population level impacts to threatened species. Impacts >1 year without defined mitigation approach. Regulatory reportable, significant enforcement action. Beyond ConocoPhillips control, requiring international and long-term oil spill response organisation (OSRO) resources.	>1 year restriction on access. Severe impact to/from key stakeholders requiring executive level involvement.

Rating	Environmental	Socio-economic and Cultural
4 Major	Major environmental impact. Release affecting large areas including sensitive habitats, fisheries, commercial users, threatened species and culturally sensitive areas with potential for short to moderate-term population level impacts. Impacts >1yr. Regulatory reportable, material enforcement action. Beyond ConocoPhillips control, requiring OSRO resources.	3 months – 1 year restriction on access. Major impact to/from key stakeholders requiring Senior level management involvement.
3 Moderate	Moderate environmental impact. Release affecting surrounding area, with regional impact. Impacts mitigated through natural processes in <1yr. Regulatory reportable, potential for minor enforcement action. Within ConocoPhillips control (in conjunction with offshore contractor and local OSRO).	1-3 month restriction on access. Moderate impact to/from key stakeholders, with focused efforts with various business unit groups.
2 Minor	Minor environmental impact. Minor spill to sea (minor Loss of Containment (LOC)) Localised and temporary impact. Impacts mitigated through natural processes in short duration (weeks to month). Regulatory recordable. Within ConocoPhillips control (via offshore contractor).	1 day – 1 month restriction on access. Minor impact to/from key stakeholders, with efforts of stakeholder engagement professionals.
1 Negligible	Negligible environmental impact. Instantaneous contained spill or small spill to sea (less than 1 m^3). Waste load contamination. No risk of environmental damage, impacts <1 month. Regulatory recordable. Within ConocoPhillips control (via offshore contractor).	<1 day restriction on access. Negligible impact to/from key stakeholders, with efforts of stakeholder engagement professionals.

Risk Matrix		Consequence Severity				
		Level 1 (Negligible)	Level 2 (Minor)	Level 3 (Moderate)	Level 4 (Major)	Level 5 (High)
Likelihood	Frequent (5)	RR II	RR II	RR III	RR IV	RR IV
	Probable (4)	RR I	RR II	RR III	RR III	RR IV
	Rare (3)	RR I	RR II	RR II	RR III	RR III
	Remote (2)	RR I	RR I	RR II	RR II	RR II
	Improbable (1)	RR I	RR I	RR I	RR I	RR II

Assessing likelihood considers historical information and requires professional judgement	
Frequent (5)	Occurs multiple times/year within the ConocoPhillips business unit.
Probable (4)	Occurred within Australian Business Unit or more than once/year within ConocoPhillips.
Rare (3)	Occurred within ConocoPhillips or more than once/year within the oil and gas industry.
Remote (2)	Occurred or has been heard of within the oil and gas industry.
Improbable (1)	Virtually unrealistic, never heard of in the oil and gas industry

Risk Rating		
RR IV	High	Manage risk using additional or improved risk-reducing measures with priority. Inform appropriate management level with risk assessment detail and obtain appropriate approvals per the business unit's requirements.
RR III	Significant	Manage risk using additional or improved risk-reducing measures with priority. Inform appropriate management level with risk assessment detail and obtain appropriate approvals per the business unit's requirements.
RR II	Medium	No additional risk-reducing measures required where controls can be verified as functional. Improvements based on lessons learned are encouraged.
RR I	Low	No additional risk-reducing measures required. Improvements based on lessons learned are encouraged.

Figure 5-2: ConocoPhillips risk assessment matrix

5.4.4. Define Acceptable Levels

Evaluation criteria to define acceptable level(s) of impact and risk were established having regard to all relevant context, including:

- The Principles of Ecologically Sustainable Development (ESD) as defined in section 3A of the EPBC Act
- Legislative and other requirements e.g. laws, policies, standards, conventions, statutory instruments such as recovery plans for threatened species, plans of management for protected places
- Internal context, i.e. consistent with corporate environmental policy, culture and company standards
- External context, i.e. the environment and relevant persons expectations informed during consultation and the public comment process
- Guidance for defining risk criteria, provided in the Risk Management Guidelines (AS ISO 31000:2018) and Handbook for Managing Environment-related Risk (HB 203:2012), and
- Best practice found in nationally and internationally recognised industry guidance, such as that published by the International Petroleum Industry Environmental Conservation Association (IPIECA) for oil spill risks.

The acceptable level(s) of environmental impact and risk were defined before environmental performance outcomes (EPOs) were drafted and the evaluation of impacts and risks took place. These are shown in Table 5-3.

5.5. Evaluate Impacts and Risks

Evaluating environmental impacts and risks involves comparing the predicted levels against the defined acceptable level(s) of environmental impact and/or 'tolerable' levels of risk. This in turn supports decision making regarding acceptability of the activity and the need for additional or different mitigation and/or management measures. Evaluation involves a number of processes including:

- Identifying and evaluating control measures
- Evaluating potential trade-offs
- Evaluating the potential for cumulative impacts
- Establishing Environmental Performance Outcomes (EPOs)

5.5.1. Identify and Evaluate Control Measures

All offshore activities in waters between 3 and 200 NM must be undertaken in line with an accepted EP. The EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to ALARP and acceptable levels.

There are five types of mitigation and management measures as explained below in Figure 5-3.

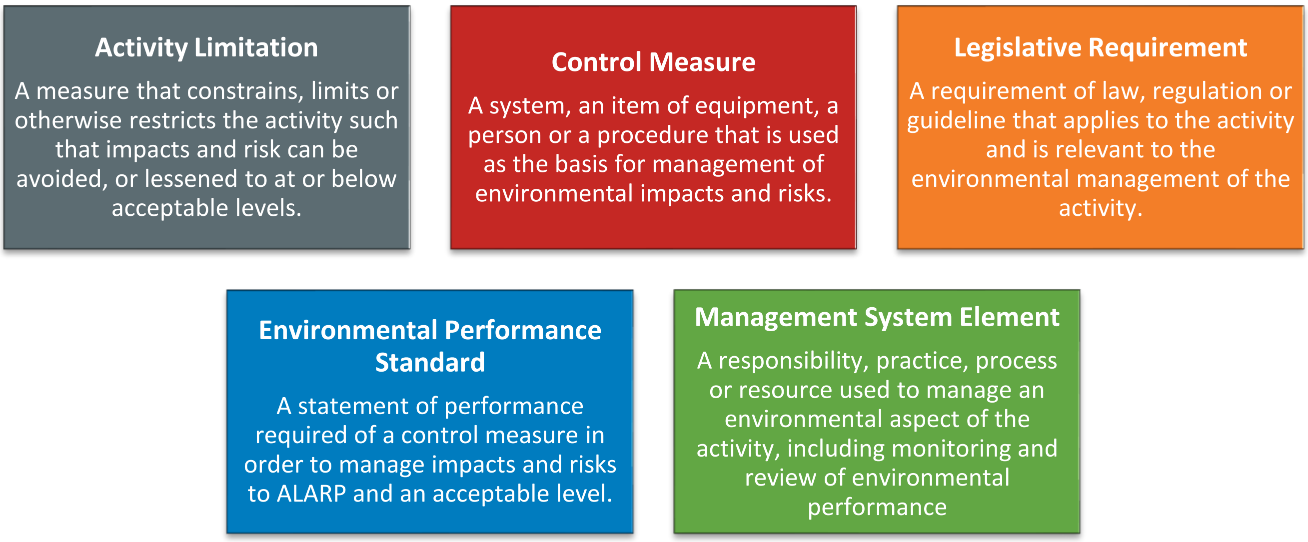


Figure 5-3: Types of mitigation and management measures

Legislative and other best practice requirements act as a minimum level of environmental management and control measures are adopted to ensure they are complied with. Evaluation is a systematic process of considering alternative and additional mitigation and management measures and performance standards along with consideration of improving the performance of adopted measures and performance standards. It includes:

- The separate consideration of 'consequence' and 'likelihood' (in relation to risks), with the adoption of measures showing how likelihood and/or consequence will be reduced.
- Consideration of relevant information acquired during consultation and/or the public comment period to inform the need for, or design of, measures
- Consideration of relevant parameters of measure performance, which is important when a measure can be designed to perform to different levels
- Assessing effectiveness of measures in managing the causes of impact and risk and resultant consequences

- Acknowledgement of uncertainty in predictions of environmental impacts and risk and/or low levels of confidence in the ability to manage impacts and risk to an acceptable level and, where necessary, conducting impact verification studies and/or applying an adaptive management approach, and
- Documenting the facts and reasons that support the choices and decisions about consideration, rejection and adoption of measures that reduce environmental impacts and risks.

Mitigation and management control measures are adopted in the design and implementation of the activity to reduce environment impacts and risks. They are typically specific to the environmental setting of the activity and are informed through consultation. Where additional information about potential control measures was identified during consultation and resulted in a modification of EP content, the relevant consultation event is indicated by the Event ID and the specific feedback provided can be matched to the FB ID number.

5.5.2. Evaluate Potential Trade-offs

Where interacting or conflicting environmental outcomes were identified, trade-off decisions affecting mitigation and management measures were evaluated to identify if they are beneficial or not. Outcomes are documented to minimise the risk of eroding environmental performance over time.

5.5.3. Evaluate Potential for Cumulative Impacts

NOPSEMA defines cumulative environmental impacts in the context of offshore petroleum activities, as successive, additive or synergistic impacts of collectively significant activities or projects with material impacts on the environment that have the potential to accumulate over temporal and spatial scales (NOPSEMA Environment Plan Decision Making Guideline, N-04750-GL1721 A524696, Dec 2022).

This definition infers that cumulative impact screening is required for all potential impacts associated with the activity to determine which aspects, when assessed in conjunction with other aspects and with other significant activities or projects, result in material impacts that have the potential to accumulate over temporal and spatial scales; and it is these aspects that are then carried through the cumulative impact assessment process as defined in Section 9.

5.5.4. Establish Environmental Performance Outcomes (EPOs)

Analysis information was used to develop environmental performance outcomes (EPOs). EPOs provide a measurable level of performance for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level.

EPOs have been developed based on published/externally agreed levels of significance, including the following:

- Ecological receptors: MNES: Significant Guidelines 1.1 to identify the relevant significant impact criteria. The highest category for the listed threatened species or ecological communities likely to be present within the EMBA is used, for example: endangered over vulnerable. Where appropriate species recovery plan actions and/or outcomes
- Commercial fisheries: Victorian Fishing Authority core outcome of sustainable fishing and aquaculture (https://vfa.vic.gov.au/about), and
- Marine users: OPGGS Act 2006 (Cth) Section 280.

5.6. Treat Impacts and Risks

A reiterative process was taken to treat impacts and risks whereby predicted levels of impact and risk were compared to the defined acceptable levels and additional or alternative measures were identified and applied as described in Section 5.6.1, where necessary.

Where there is uncertainty in a prediction or effectiveness of a measure that may result in the possibility for unacceptable impacts, the uncertainty is identified and managed as described in Section 5.6.2.2. The residual predicted level of impact or risk is then again compared to the defined acceptable levels as described in Section 5.6.3.

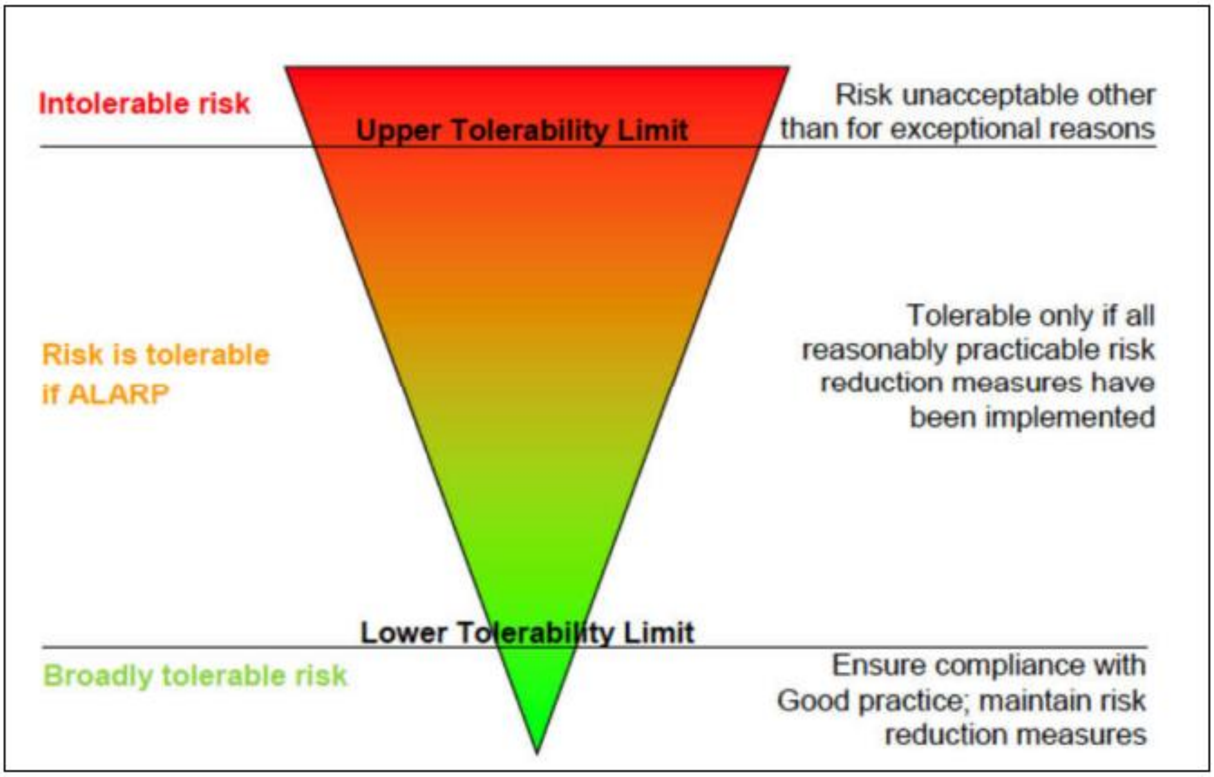
5.6.1. Continue to Identify and Evaluate Control Measures

Control measures for impacts and risks continue to be identified and evaluated as described in Section 5.5 until it can be demonstrated that they are ALARP.

At any time, should there be a temporary or permanent change to the organisation, personnel, systems, procedures, equipment, products, materials and/or critical assumptions (as described in Section 10.2.7), re-evaluation will occur so that impacts and risks remain ALARP and at an acceptable level.

5.6.2. Determine ALARP Status

The ALARP status of each impact and risk was assessed based on the sufficiency of the measures already established and the opportunity for new measures to be implemented. Central to the ALARP principle is that infinite time, effort and money could be spent attempting to reduce an impact or risk to zero. This concept is shown in Figure 5-4.



Source: CER (2015).

Figure 5-4: Principles of ALARP (Adapted from NOPSEMA (2020))

ConocoPhillips Australia has undertaken to demonstrate that impacts and risks are reduced to levels that area as low as reasonably practicable (ALARP) when the cost and effort required to make further reductions is grossly disproportionate to the benefit gained. A corresponding statement of ALARP is provided for each impact and risk assessment to justify the overall certainty and effectiveness of reducing potential impacts and risks to ALARP, using the adopted control measures.

Reducing impacts and risks to ALARP is an ongoing process and new measures may be identified at any time, including during operations.

Decisions to implement proposed measures were reviewed by a multidisciplinary team with relevant expertise in the environmental management and conduct of offshore exploration activities [Paragraph updated in response to Matter: I23], and included consideration of:

- Hierarchy of controls – sets out the order in which controls must be considered i.e. elimination, prevention, reduction and then mitigation
- Technically feasible and commercial ability to implement
- Likely support and implementation by persons with relevant roles and responsibilities
- Consistency with national or industry standards and practices
- Possibly introduction of additional impacts or risks in other activity areas (e.g., safety)
- Effectiveness of the change, taking into account the:
    - Current level of impact and risk with existing controls
    - Amount of additional reduction that the control will deliver
    - Level of confidence that the reduction will be achieved, and
    - Resources, schedule and cost required to implement the control.

The level of detail included within the each ALARP assessment has been based upon:

- The nature and scale of the residual impact or risk, with more detail provided for impacts where the consequence category is Moderate (3) or above and risk level of Medium (RR II) or above (i.e. higher order), and
- The degree of uncertainty associated with the assessed impact or risk, or the effectiveness of control measures.

These concepts are explained in more detail in the following sections.

5.6.2.1. Residual Impact and Risk Ratings

Lower Order Environmental Impacts and Risks

NOPSEMA defines lower order environmental impacts and risks as those where the environment or receptor is not formally managed, less vulnerable, widely distributed, not protected and/or threatened and there is confidence in the effectiveness of adopted measures.

ConocoPhillips Australia considered impacts are lower-order and inherently ALARP when the impact consequence is Negligible (1) or Minor (2). Risks are considered to be lower-order and ALARP where the risk rating is Low (RR I). In these cases, applying 'good industry practice' is sufficient to manage the impact or risk to ALARP. NOTE: The identification of lower order impacts and risks may occur during the analysis (see Section 5.4.2), evaluate and/or treat phases as alternative/additional measures and performance standards are applied, or options to improve the performance of adopted measures and performance standards are identified.

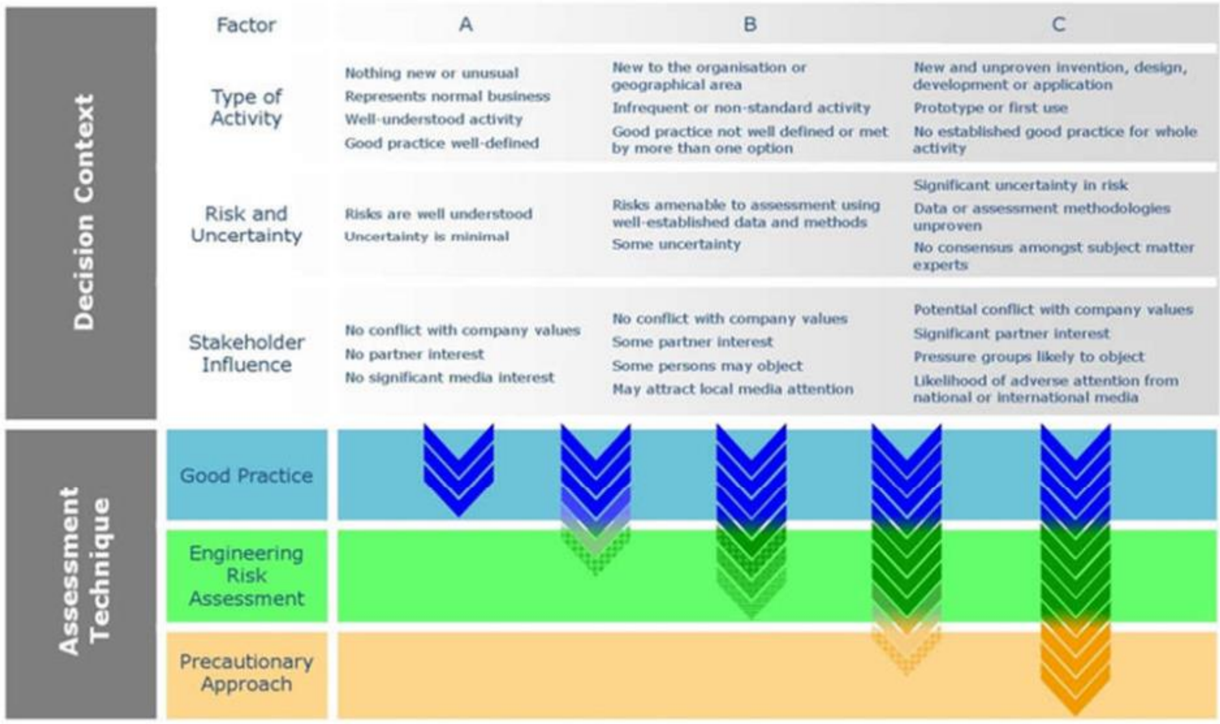
Higher Order Environmental Impacts and Risks

NOPSEMA defines all other environmental impacts and risks as higher order impacts and risks i.e., where the environment or receptor is formally managed, vulnerable, restricted in distribution, protected or threatened and there is little confidence in the effectiveness of adopted measures.

For higher order impacts where the consequence is Moderate (3), or for risks where the rating is Medium (RR II), ConocoPhillips Australia considers that the impact/risk may be 'tolerable' if all reasonably practicable mitigation measures have been implemented (i.e. ALARP can be demonstrated), and controls can be verified as functional.

5.6.2.2. Uncertainty of Impacts and Risks

Figure 5-5 shows the decision-making framework used to establish ALARP, based upon the level of uncertainty associated with the impact or risk, or the effectiveness of mitigation and management measures. This process is based on the United Kingdom Offshore Operators Association (UKOOA) framework (Oil & Gas UK, 2014) and NOPSEMA ALARP Guidance Note (N-04300-GN01660166, June 2020).



Source: CER (2015).

Figure 5-5: Decision-Making Framework (Adapted from NOPSEMA (2020))

This framework provides appropriate tools, commensurate to the level of uncertainty or novelty associated with the impact or risk (referred to as the Decision Type A, B or C) (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 437). The decision type is selected based on an informed decision around the uncertainty. Decision types and methodologies to establish ALARP are outlined in Table 5-2.

Table 5-2: ALARP decision-making based on level of uncertainty

Decision type	Decision-making tools
A	Good industry practice
Identifies the requirements of legislation, codes and standards that are to be complied with for the activity. Applies the ‘Hierarchy of Controls’ philosophy, which is a system used in the industry to identify effective controls to minimise or eliminate exposure to impacts or risks. Identifies further engineering control standards and guidelines that may be applied over and above that required to meet the legislation, codes and standards.	
B	In addition to decision type A: Engineering risk-based tools
Engineering risk-based tools to assess the results of probabilistic analyses such as modelling, quantitative risk assessment and/or cost benefit analysis to support the selection of control measures identified during the risk assessment process.	
C	In addition to decision type A and B: Precautionary Principle
Application of the Precautionary Principle is to be applied when good industry practice and engineering risk-based tools fail to address uncertainties.	

5.6.3. Evaluating Acceptability of Environmental Impacts and Risks

Evaluating the acceptability of environmental impacts and risks involves comparing the predicted levels against the defined acceptability evaluation criteria to support decision making regarding acceptability of the activity. This comparison is done considering legislative and typical (best practice) controls are in place. If the predicted level of impact or risk is greater than the defined acceptable level, further controls or changes to the activity are required to ensure the environmental impact or risk can be managed to the defined acceptable level.

An 'acceptable level' is the specified amount of environmental impact and risk that an activity may have which is tolerable, is consistent with all relevant principles, and does not compromise the management, conservation or protection objectives of the environment.

Following demonstration that all effective and practicable control measures have been adopted to reduce the impacts and risks to ALARP, compliance with the pre-defined acceptable levels of impact or risk is assessed using ConocoPhillips Australia's acceptability evaluation criteria, and an acceptability statement is provided.

ConocoPhillips Australia's acceptability evaluation criteria, the processes applied to check impacts and risks against the criteria, and the method of evaluation are defined in Table 5-3.

Table 5-3: Acceptability evaluation criteria, process checks and application to the EP

Acceptability Criteria	Process Check	Application to Environmental Impact and Risk Assessment Process
Principles of Ecologically Sustainable Development		
Integration Principle: Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social, and equitable considerations.	Has the decision-making processes integrated long-term and short-term economic, environmental, social, and equitable considerations?	This principle is addressed by defining acceptable levels of impact and risk for biological, ecological, socio-economic and cultural features of the environment, against which the predicted levels of impact and risk are compared. The environmental impact and risk assessment process inherently meets this principle as it requires the consideration of short to long-term impacts and risks to biological, ecological, socio-economic and cultural features of the environment. This process is informed by legislation, conservation advice, recovery plans and management plans, and through consultation with relevant persons. In addition, the ALARP process inherently balances the economic cost/ effort against environmental benefit.
Precautionary Principle: If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	If impacts/risks are considered serious or irreversible, is there enough appropriate information available to understand the risk? If significant scientific uncertainty exists, has the precautionary principle been applied?	At the conclusion of each impact and risk assessment a level of predictive uncertainty is assigned. If there is residual uncertainty this will be assessed, and measures implemented to either remove the uncertainty or apply the precautionary principle. Activities where environmental damage is temporary / reversible, small scale and/or low intensity are deemed to be of an acceptable level (see Intergenerational Principle).
Intergenerational Principle: The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	Do activities have the potential to result in serious or irreversible, environmental damage?	Each impact and risk assessment considers whether there is potential for serious or irreversible environmental damage. This has been completed for each aspect by using this criterion as one of the defined acceptable levels against which acceptability is assessed. Activities where environmental damage is temporary / reversible, small scale and/or low intensity are deemed to be of an acceptable level. ConocoPhillips Australia defines this as environmental impacts that have a worst-case consequence ranking less than Major (4) and risks that have a risk rating below Significant (RR III).
Biodiversity Principle: The conservation of biodiversity and ecological integrity should be a fundamental consideration in decision making.	Is there the potential to affect biological diversity and ecological integrity? Does the EP align with the aims and objectives of EPBC Management Plans and Recovery Plans?	The EP must demonstrate that the activity is not inconsistent with EPBC recovery plans or threat abatement plans for a listed threatened species or ecological community, or a management plan for an Australian Marine Park or Ramsar Wetland. This means that the acceptable level of impact and risk will be consistent with these plans which aim to ensure biological diversity and ecological integrity is maintained.
Valuation Principle:	Have all reasonably practicable control measures been adopted	The application of measures provides for the titleholder to bear the cost of environmental management for the activity to ensure that the environmental impacts and risks are reduced to ALARP and are of an

Acceptability Criteria	Process Check	Application to Environmental Impact and Risk Assessment Process
Improved valuation, pricing, and incentive mechanisms should be promoted.	to reduce environmental impacts and risks to ALARP?	acceptable level. The ALARP assessment inherently balances the economic cost against environmental benefit.
Transparency Principle: Decision-making should be transparent and involve participation of potentially affected communities and stakeholders	Have measures been adopted because of the consultations to address reasonable objections and claims of relevant persons? Have the views of public have been considered in the preparation of the EP?	The EP must demonstrate that the titleholder has adequately consulted with each relevant person in the course of preparing the EP. The Environment Plan must be made available for public comment and the titleholder must appropriately consider any submissions made during the public comment period (addressed in External Context).
Internal Context		
ConocoPhillips Policies	Is the proposed management of the hazard aligned with ConocoPhillips' HSEMS and environmental impact and risk assessment process?	The EP must demonstrate that all reasonably practicable control measures have been adopted to reduce environmental impacts and risks. Environmental impacts and risks are consistent with environmental policies and processes such that residual environmental impacts will have a consequence severity that is less than Major (4) and residual risks will have a risk rating that is less than Significant (RR III).
External Context		
Relevant Persons Consultation	Have relevant persons raised any objections or claims about activity impacts or risks? If so, where the objection or claim has high merit, have measures been put in place to manage them?	The EP must document where measures have been adopted in response to relevant persons consultation to address reasonable objections and claims. The views of public must be considered in the preparation of the EP.
Other Requirements		
International Standards, Industry Best Practice	Have relevant international, national, and industry standards have been considered and applied?	Relevant international, national and industry standards are required to be considered and, where relevant, applied in the EP. Evidence of this is presented in the acceptability assessment within each impact and risk chapter in the EP.

5.7. Implement, Monitor, Review and Report

Monitoring, review and reporting activities are incorporated into the impact and risk management process to ensure that mitigation and management measures are effective reducing environmental impacts and risks to ALARP and to an acceptable level.

During the environmental impact and risk assessment process, Environmental Performance Outcomes (EPOs) are established, being the specific and measurable benchmarks that ConocoPhillips Australia is seeking achieve for the life of the activity. These function as the key criterion to enable management response prior to the acceptable level being exceeded.

Assessment of achievement of the EPOs is managed through the establishment of:

- Mitigation and management measures (collectively called 'control measures') which are identified and adopted to support achievement of the EPOs.
- Environmental Performance Standard (EPS) which are developed for each control measure and represent the parameters against which the control measure is assessed to ensure it consistently performs to reduce impact or risk to ALARP and to an acceptable level. EPS also form the basis for environmental performance reporting, and
- Measurement Criteria (MC) which document the things ConocoPhillips Australia will use to determine whether the stated levels of performance are being met.

The EPOs, Control Measures, EPS and MCs developed for the Otway Exploration Drilling Program are collated in Section 9. More detail on monitoring, review and reporting is provided in the Implementation Strategy in Section 10.

6. Environmental Impact Assessment

6.1. Overview

This section of the Environment Plan (EP) documents ConocoPhillips Australia's assessment of the environmental impacts associated with the Otway Exploration Drilling Program, appropriate to the nature and scale of each, in accordance with the methodology described in Section 5. This section also details the evaluation of control measures (being systems, procedures, personnel or equipment) to reduce impacts to as low as reasonably practicable (ALARP); compares residual impacts to the defined acceptable levels; and establishes Environmental Performance Outcomes (EPOs) which represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve.

Environmental Performance Standards (EPS) and measurement criteria associated with each of the identified control measures are provided in Section 9.

The established context of impacts is summarised in Appendix A.

6.2. Interference with Other Marine and Coastal Users

6.2.1. Hazards

The Otway Exploration Drilling Program may interfere with other marine and coastal users from the following activities:

- Vessel activities, and
- MODU activities.

6.2.2. Environmental Impacts

During community information sessions, ConocoPhillips Australia received feedback that the proposed activities may impact commercial fishing operators' ability to undertake regular activities and may impact regular use of the marine environment (Document ID: 3923). ConocoPhillips Australia is aware that interference with other marine and coastal users from the activities listed above may result in the following potential impacts:

- Changes to the functions, interests or activities of other users, and
- Changes to the visual amenity of coastal locations (excluding impacts associated with light emissions which are assessed in Section 6.4).

For example, the physical presence of seabed survey vessels, the drilling rig and support vessels used for the activity, and the establishment of exclusion zones, may result in the displacement of other marine users engaging in activities such as recreational and commercial fishing.

NOPSEMA defines 'environment' to mean ecosystems and their constitute parts, including people and communities; natural and physical resources; the qualities and characteristics of locations, places and areas; the heritage value of places; and the social, economic and cultural features of all of these matters (NOPSEMA 2020). Consequently, vessel and MODU activities associated with offshore exploration activities have been assessed to have the potential to impact on the values and sensitivities of other marine users within the operational areas and coastal users in certain circumstances.

6.2.3. Defining the Environment that May Be Affected (EMBA)

Table 6-1 describes the basis for defining the EMBA, supporting sources and resulting spatial extents.

Table 6-1: Interference with Other Marine Users EMBA definition

Aspect	EMBA	Basis of EMBA	Source	Spatial Extent
Interference with Other Marine and Coastal Users	Operational Areas	To avoid changes to the functions, interests or activities of other users.	As per this EP the Otway Exploration Drilling Program impact assessment will be undertaken within the operational areas and along coastlines.	Operational areas (and adjacent coastal area)

6.2.4. Identifying Other Marine and Coastal Users

The physical presence of survey vessels, the MODU and support vessels may interfere with other marine and coastal users such as:

- Recreation and tourism
- Research
- Commercial shipping
- Petroleum activities
- Renewable energy
- Defence activities
- Commercial fishing, and
- Cultural heritage.

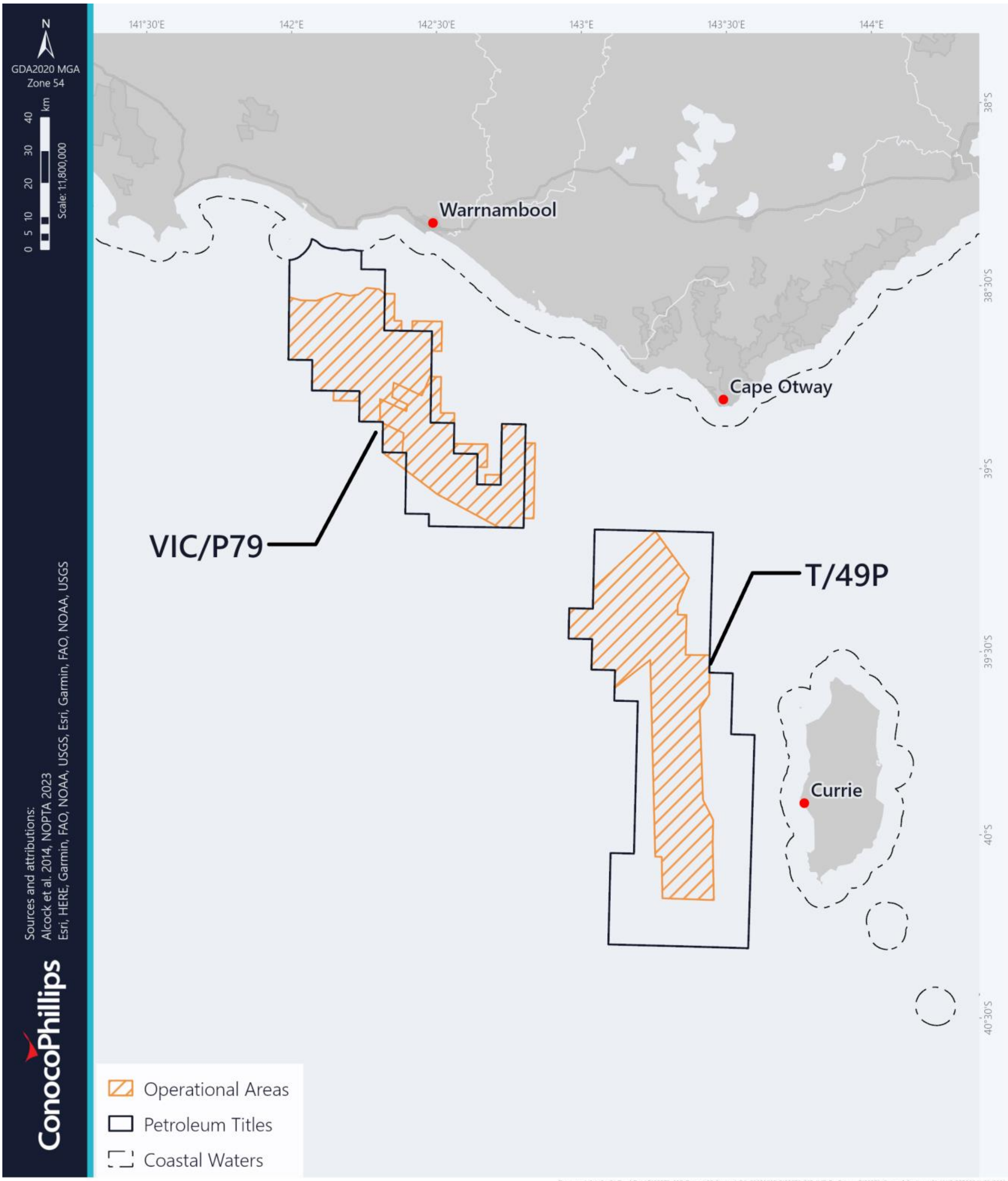


Figure 6-1: Operational Areas and adjacent coastal areas

6.2.4.1. Recreation and Tourism

The extent to which recreational and charter fishers utilise the operational areas is difficult to determine due to the nature of this sector. Given the lack of significant seabed features in the operational areas, the distance from the coast (approximately 28 km at King Island and approximately 19 km at Port Fairy) and the extent to which recreational fishers can utilise the ocean, high levels of recreational fishing are not expected to occur within the vicinity of the operational areas. Therefore, interference with recreational fishers is not assessed further.

During consultation relevant persons provided feedback on the value of Tasmanian wild fisheries, contributing significantly to their island identity and economic value, with high-value markets for shellfish, crustaceans and scale fish and almost 100,000 recreational fishers in Tasmania (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 345).

Fishing charters were identified during consultation who operate in the northern extent of VIC/P79 from locations along the Victorian coastline (Org ID: 550, Salty Dog Fishing Charters, Event ID: 1141, FB ID: 25). Identified charters typically target bluefin and Albacore tuna, Mako sharks and other pelagic species, as well as offshore reef species.

Recreational diving is likely to be restricted to coastal waters in depths <18 m but with more advanced diving possible to 40 m. Water depths within the operational areas ranges between 53 and 500 m which is beyond the recognised maximum recreational diving depth of 40 m. As recreational diving is not expected to occur within the vicinity of the operational areas it is not assessed further.

The Great Ocean Road is recognised as a national heritage place that support tourism and provides access to the spectacular coastal vistas and landscapes through construction of the serpentine route. During consultation, the economic value of the Great Ocean Road to tourism, and its reliance on a healthy natural environment was identified along with concerns around the visibility of exploration activities from the coast (Org ID: 110, Surf Coast Shire Council, Event ID: 649, FB ID: 16; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 13).

The road runs through an area that is 150 million years old and which includes rare polar dinosaur fossils, collected from sites along the coast which continue to yield important scientific information. Further, the Port Campbell Limestone coast is the definitive place in Australia to observe and study limestone geomorphology and coastal erosion processes on rocky coasts (DCCEEW 2022). Rock formations found along the limestone coast which the Great Ocean Road follows include the Twelve Apostles which is a collection of limestone stacks 45 m high that, due to erosion by waves, have been reduced down to eight. Other examples of the dynamic nature of this coast include London Arch, formerly known as the London Bridge until part of the structure collapsed unexpectedly in January 1990, and Island Arch, which collapsed in June 2009 (DCCEEW 2022).

The extent to which coastal recreation and tourism is likely to be affected by the visibility of the MODU and support vessels when in close proximity to the coastline during different operations has been assessed through Zones of Theoretical Visibility (ZTV) analysis (Appendix H). Impacts of light emissions to coastal users and ecological receptors are described in Section 6.4.

General components of the MODU and support vessels may be visible from the coastline including the following aspects:

- Derrick structure
- Deck structure, and
- Support vessels.

The seabed survey vessel is not predicted to be distinguishable from other marine traffic and potential visibility is not assessed further.

6.2.4.2. Research

During consultation ConocoPhillips Australia was advised of a marine research program being conducted within the VIC/P79 operational area. An assessment of the potential for interference with program was completed which identified that the closest distance for a potential interaction was approximately 4 km. Consequently, an environmental performance standard was developed to minimise the likelihood of interaction (Org ID: 528, Australian Oceanographic Services Pty Ltd, Org ID:508, Blue Whale Study, Event ID: 3194, FB ID: 239).

6.2.4.3. Commercial Shipping

The South-east Marine Region (which includes the Bass Strait) is one of the busiest shipping regions in Australia (DoE 2015b). Shipping consists of international and coastal cargo trade, passenger services and cargo and vehicular ferry services across Bass Strait (DoE 2015b)

The operational area for VIC/P79 lies within the main shipping route that runs east/west along Australia's southern coastline. Any drilling operations within VIC/P79 may encounter heavier concentrations of transiting commercial shipping (Figure 6-2).

Based on shipping traffic recorded by AMSA during all of 2022, an average of 4.8, 4.3 and 1.1 vessels pass through the northern extent of VIC/P79, the southern extent of VIC/P79 and T/49P operational areas respectively per day (Table 4-19). The majority of these are cargo ships and tankers.

6.2.4.4. Petroleum Activities

Within the operational areas associated with T/49P and the southern extent of VIC/P79 there are a number of abandoned wells which were explored by Esso Exploration and Production Australia over 40 years ago (see Section 4.7.2.1). The closest producing petroleum development to the operational areas is the Otway Gas Field Development, operated by Beach Energy, located 70 km south of Port Campbell and approximately 7 km west of the nearest operational area boundary in the southern extent of VIC/P79 (Figure 6-3). This development consists of the remotely operated Thylacine platform, offshore and onshore pipelines and an onshore gas processing plant located 6.4 km north-east of Port Campbell. As exploration activities will occur within the defined operational areas, no interference with offshore energy production is predicted and no further assessment is warranted.

6.2.4.5. Renewable Energy

There are currently no offshore renewable energy installations or areas 'declared to be suitable' by the Australian Government within the vicinity of the operational areas. The Proposed Area – Southern Ocean Region (Figure 4-60) extending from Warrnambool, Victoria to Port MacDonnell, South Australia, is being considered for offshore wind and other renewable energy projects. However, this initial area is a proposal for feedback only and has not been 'declared to be suitable' by the Australian Government. Whilst there are a number of proposals for windfarms off the coast of Victoria and Tasmania, no project has progressed further than pre-feasibility, technical or grid studies and no further assessment is warranted.

6.2.4.6. Defence Activities

The south-east marine region is important for a range of defence activities particularly training exercises. Australian Defence Force (ADF) activities in the region include transit of naval vessels, training exercises, shipbuilding and repair, hydrographic survey, surveillance and enforcement and search and rescue (DoE 2015b). However, there are no known ADF training, practice or prohibited areas that intersect with the operational areas, therefore no impact on defence activities from the Otway Exploration Drilling Program are predicted (Figure 6-4).

Unexploded ordnance (UXO) are a by-product of past training activities undertaken by the ADF. The Department of Defence's (DoD) interactive Unexploded Ordnance in Australia map (DoD 2021) was used to determine locations that are at risk of hosting UXO within the vicinity of the operational areas.

During community information sessions, ConocoPhillips Australia received feedback regarding historic ordnance dumps in the area (Document ID: 3923). During previous discussions with the Directorate of Contamination Assessment Remediation and Management Infrastructure Division, Estate & Infrastructure Group (DoD EIG 2021 in ConocoPhillips Australia 2021) ConocoPhillips Australia was advised that Area 1052 (designated as having an UXO category of 'Slight Potential') intersects the operational areas (Figure 6-4):

- Area 1052 – former air-to-air firing range. Air-to-air training activities conducted within these bounds. Majority of ammunition would have been Ball (non-high explosive). The ADF stated that the risk to the previous Sequoia MSS from this ammunition was negligible (UXO Category: Slight Potential) (DoD EIG 2021).

During consultation (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 158), ConocoPhillips Australia was advised that:

- all activities in the area are conducted at its own risk; and
- the Commonwealth of Australia, represented by the Department of Defence, takes no responsibility for:
  - reporting the location and type of UXO that may be in the areas
  - identifying or removing any UXO from these areas, and
  - any loss or damage suffered or incurred by ConocoPhillips Australia or any third party arising out of, or directly related to, UXO in the area.

Consequently, ConocoPhillips Australia commissioned a desktop study and risk assessment be conducted by RPS Explosives Engineering Services (RPS) (Appendix K, RPS 2022) to establish the risk level presented across both permit areas. This study was conducted using RPS' in-house UXO risk assessment tool which assesses the risk associated with each type of munition that may be present and each pathway to exposure i.e. activity (such as anchoring, drilling, grab sampling), including:

- The probability of encounter
- The probability of detonation, and
- The consequence of detonation for differing receptors.

This study concluded that there was a 'Low' risk of encountering UXOs within VIC/P79 or T/49P for all activities, with the exception of Snag on Vessel. The risk level of a UXO being snagged on submarine equipment and subsequently brought onto a vessel (Snag on Vessel), e.g. during retrieval of cable, was assessed as 'Moderate' based on the increased severity of the consequence.

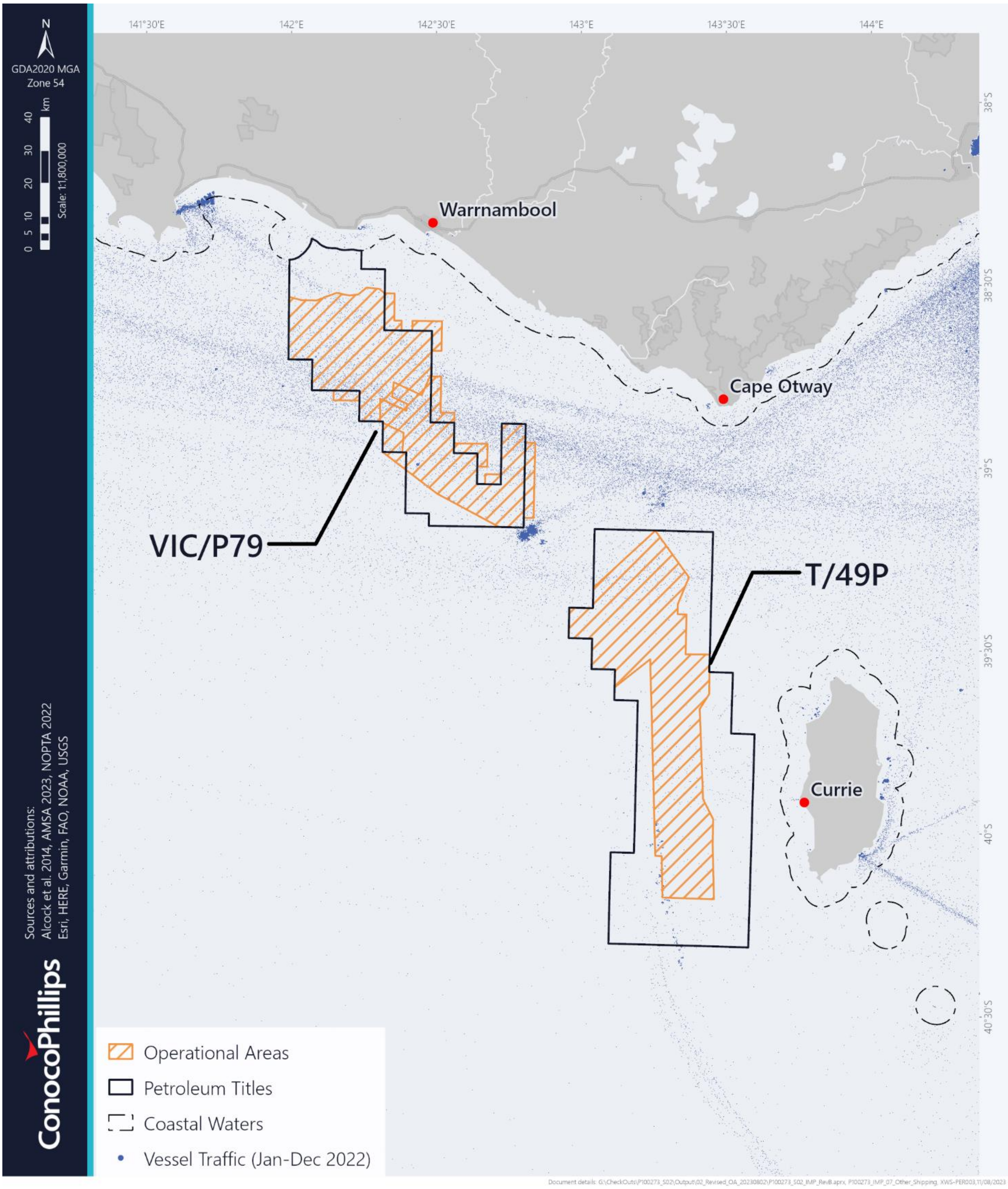


Figure 6-2: Commercial shipping activities within the operational areas

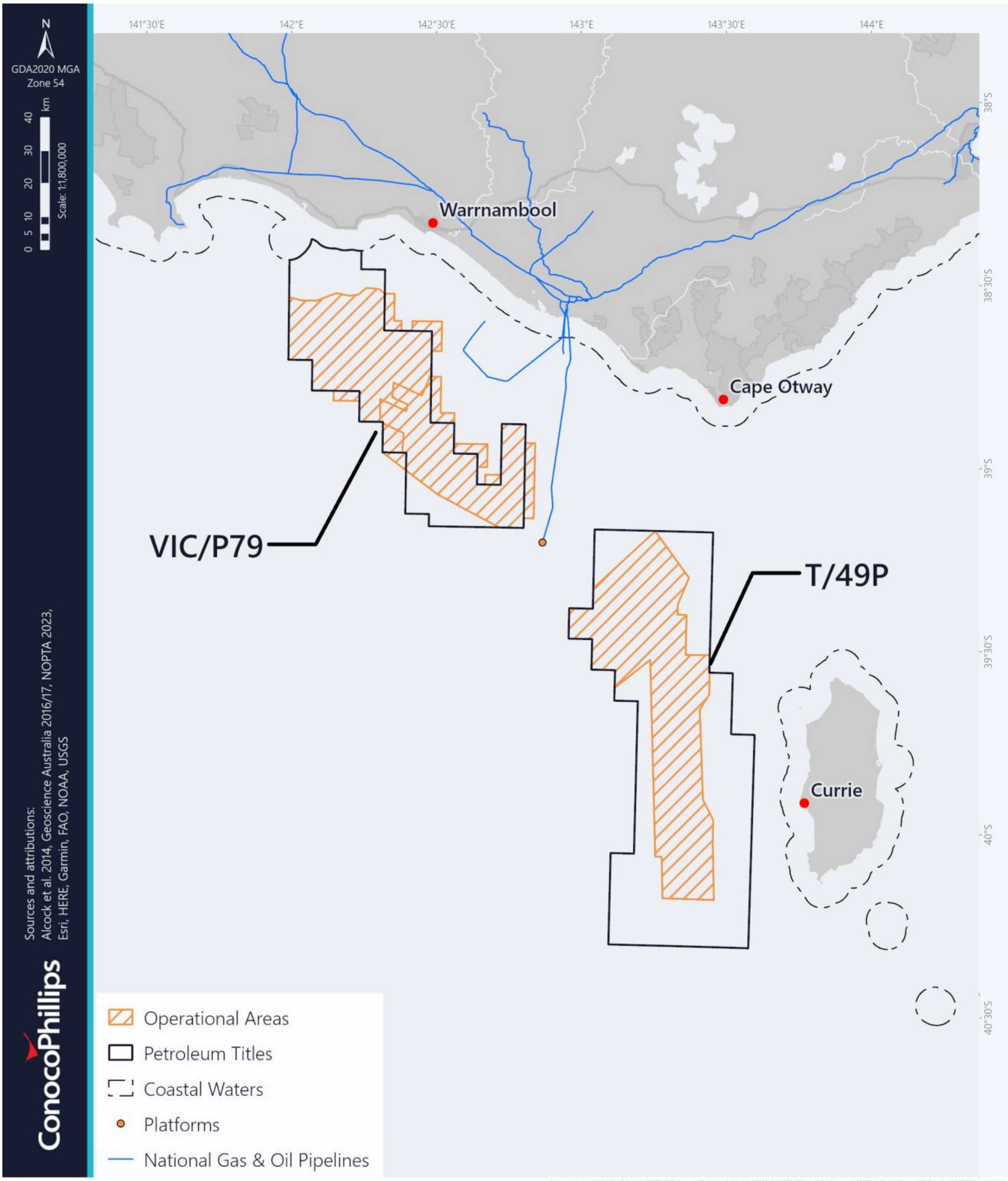


Figure 6-3: Petroleum activities within the vicinity of the operational areas

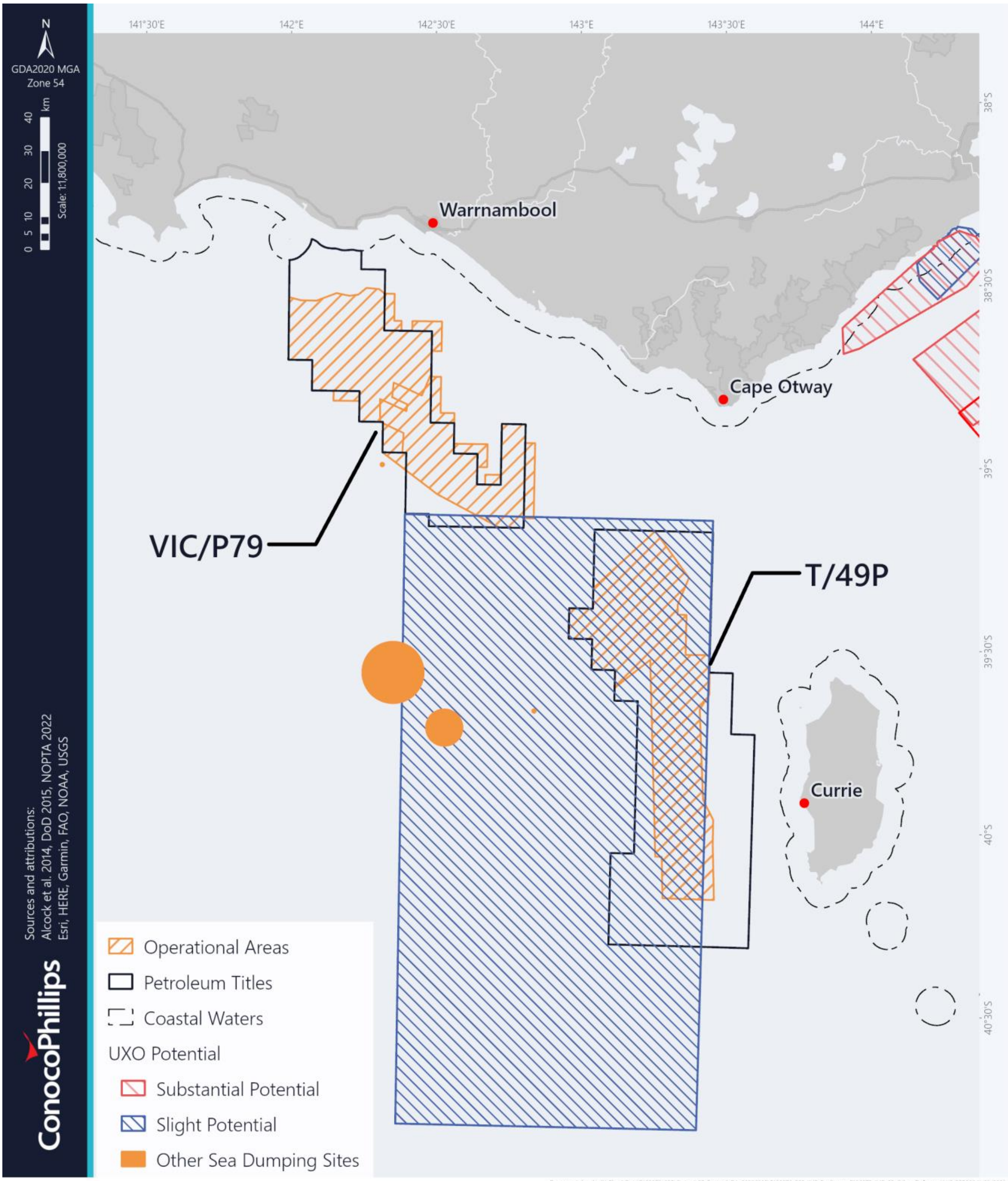


Figure 6-4: Defence activities within the operational areas

6.2.4.7. Commercial Fishing

Multiple fisheries from three fishing management jurisdictions (Commonwealth, Victorian and Tasmanian) overlap the operational areas, including:

- Nine Commonwealth fisheries
- Seven Victorian fisheries, and
- Two Tasmanian fisheries.

Table 6-2 lists these fisheries and notes if recorded fishing activity has occurred within the operational areas within the last five years:

Table 6-2: Presence of commercial fisheries and fishing activity within the operational areas

Fishery	Recorded fishing intensity in the operational areas in the last 5 years
Commonwealth	
Bass Strait Central Zone Scallop Fishery (BSCZSF)	X†
Eastern Skipjack Tuna Fishery (ESTF)	#
Eastern Tuna and Billfish Fishery (ETBF)	X†
Small Pelagic Fishery (SPF)	X
Southern and Eastern Scalefish and Shark Fishery – Commonwealth Trawl Sector (SESSF – CTS)	✓
Southern and Eastern Scalefish and Shark Fishery – Gillnet Hook Trap Sector Shark Gillnet sub-sector (SESSF – CGS)	✓
Southern and Eastern Scalefish and Shark Fishery – Gillnet Hook Trap Sector Shark Hook sub-sector (SESSF – CSHS)	X†
Southern and Eastern Scalefish and Shark Fishery SESSF – Scalefish Hook Sector (SESSF – SHS)	X†
Southern Bluefin Tuna Fishery (SBTF)	X
Southern Squid Jig Fishery (SSJF)	✓
Victorian	
Abalone	X
Giant Crab Fishery	✓
Multi-species Ocean Fishery	✓
Octopus Fishery	✓
Rock Lobster Fishery	✓
Scallop Fishery	X
Wrasse Fishery	X
Tasmanian	
Giant Crab Fishery	✓
Rock Lobster Fishery	✓

†Operational areas are overlapped by an area designated as maximum area fished (reporting grid) at a resolution of one degree (approximately 111 x 111 km).
During consultation, it was identified that although the eastern sector of the Australian Skipjack Fishery (ESKJ) is not currently active (there are 13 fishing permits issued in the ESKJ, but no TAC is allocated), there is significant potential in the Eastern sector (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 472).

Commonwealth Fisheries

Commonwealth fisheries are managed by the Australian Fisheries Management Authority (AFMA) under the Fisheries Management Act 1991 (Cth). AFMA jurisdiction covers the area of ocean from 3 nm from the coast out to the 200 nm limit (the Australian Fishing Zone (AFZ)). Within Commonwealth fishery data sets, relative fishing intensity is an area where five or more fishing vessels operated and consists of the relative effort expended or the catch. Maximum area fished (reporting grid) shows the total area where fishing occurred at a resolution of one degree (approximately 111 x 111 km). Intensity may not be reported if less than five vessels operated within the area.

Bass Strait Central Zone Scallop Fishery (BSCZSF)

No fishing intensity data between 2016 and 2021 overlaps the operational areas. However, the T/49P operational area is overlapped by a single reporting grid which occurred once in the past five years in 2019. Little or no fishing activity from the Bass Strait Central Zone Scallop Fishery is expected within the operational areas with fishing intensity data shown to occur to the east of King Island (Figure 6-5).

Eastern Tuna and Billfish (ETBF)

No fishing intensity data between 2016 and 2021 overlaps the operational areas. However, the VIC/P79 operational area is overlapped by two reporting grids which occurred once in the past five years in 2017. Little or no fishing activity from the Eastern Tuna and Billfish Fishery is expected within the operational areas with fishing intensity data shown to occur in southern NSW (Figure 6-6).

Southern and Eastern Scalefish and Shark Fishery – Commonwealth Trawl Sector (SESSF – CTS)

All operational areas are overlapped by an area designated as low intensity fishing (<0.5 hours/km^2) for each year between 2016 and 2021 for the otter-board trawl segment of the Commonwealth Trawl Sector. Data shows fishing activity for the SESSF – CTS (otter-board trawl) is primarily along the continental shelf spanning from South Australian offshore waters to NSW offshore waters plus the west and east coasts of Tasmania (Figure 6-7). The T/49P operational area overlaps the combined 2016 to 2021 five-year low intensity data by 0.8% and has no overlap with moderate or high intensity fishing areas. The VIC/P79 operational area overlaps the combined 2016 to 2021 five-year low and moderate fishing intensity data by approximately 1.61% and 1.45% respectively with no overlap with high intensity fishing areas.

No fishing intensity data overlaps the operational areas for the Danish-seine segment of the Commonwealth Trawl Sector. However, the operational areas are overlapped by three reporting grids all from the 2020 – 2021 season. Little or no fishing activity from the Commonwealth Trawl Sector (Danish-seine) fishery is expected within the operational areas as fishing activity is primarily in the Gippsland area and to the east of Tasmania (Figure 6-8). Therefore, activities from the Otway Exploration Drilling Program are unlikely to have an impact to fishers within the SESSF Commonwealth Trawl Sector fishery.

Southern and Eastern Scalefish and Shark Fishery – Shark Gillnet Sector and Shark Hook Sector (SESSF – CGS/CSHS)

Although reporting grids do overlap both the VIC/P79 or T/49P operational areas, the Gillnet Hook Trap Sector Shark Hook sub-sector (CSHS) reports show no fishing intensity data overlapping the operational areas between 2016 and 2021 (Figure 6-9). Fishing intensity data shows most activity for the SESSF – Shark Hook Sector off the coast of South Australia (ABARES 2022). Little or no fishing activity from the Shark Hook Sector is expected within the operational areas.

The Gillnet Hook Trap Sector Shark Gillnet sub-sector (CGS) reports show that the operational areas do overlap an area with recorded fishing intensity for data from 2016 to 2021 (Figure 6-10). The T/49P and VIC/P79 operational areas overlap combined 2016 to 2021 five-year low, medium and high intensity data by approximately 1.54%, 0.52% and 0.77% respectively. Therefore, activities from the exploration program are unlikely to have an impact to fishers within the fishery.

Southern and Eastern Scalefish and Shark Fishery SESSF – Scalefish Hook Sector (SESSF – SHS)

No fishing intensity data overlaps the operational areas. However, the operational areas are overlapped by reporting grids for the 2020 – 2021 season. Fishing intensity data shows most activity for the SESSF – Scalefish Hook Sector occurs to the south-east of Tasmania (Figure 6-11). Little or no fishing activity from the SESSF – Scalefish Hook Sector is expected within the operational areas. Therefore, activities from the Otway Exploration Drilling Program are unlikely to have an impact to fishers within the fishery.

Southern Squid Jig Fishery (SSJF)

Intensity data for the period 2016 to 2021 shows that the operational areas overlap the low, moderate and high intensity areas by approximately 15.95%, 25.01% and 36.1% respectively (Figure 6-12). However, a single drilling area of 2 km will have a maximum overlap of each low, moderate or high intensity area by 0.26%, 0.8% and 0.8% respectively. Therefore, activities from the exploration program are unlikely to have an impact to fishers within the Commonwealth Southern Squid Jig Fishery.

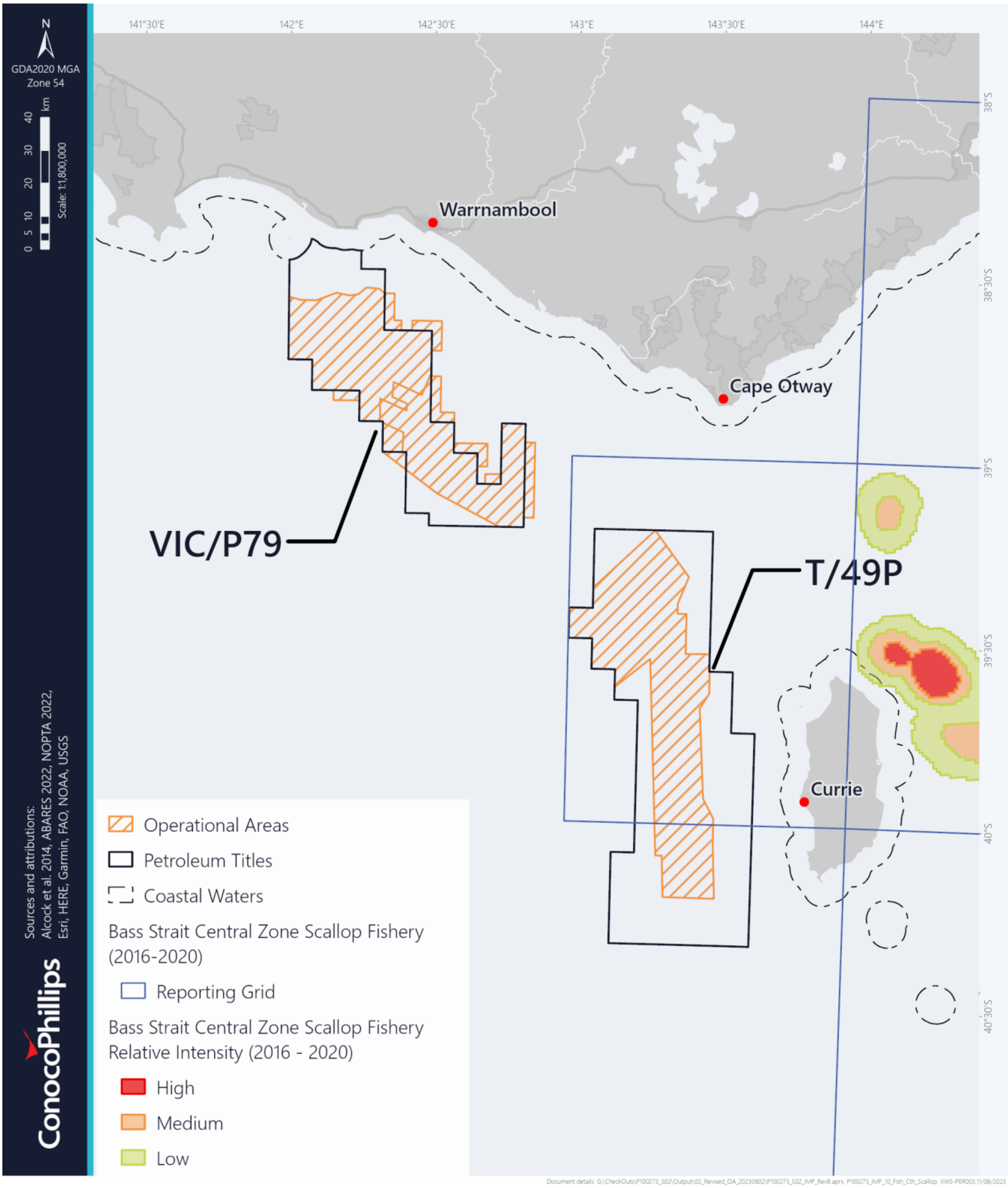


Figure 6-5: Bass Strait Central Zone Scallop Fishery (BSCZSF) intensity within the operational area

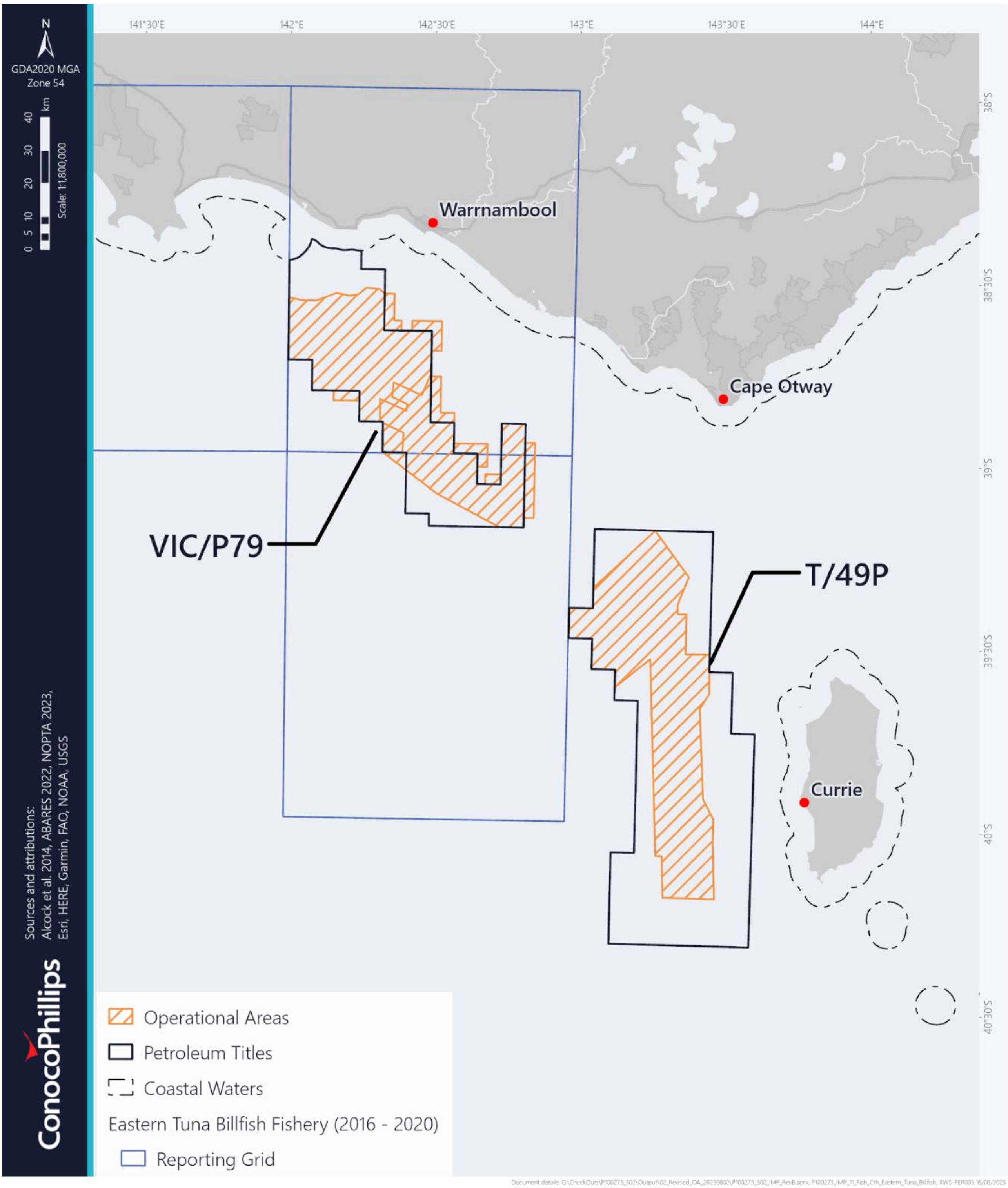


Figure 6-6: Eastern Tuna and Billfish Fishery (ETBF) intensity within the operational area

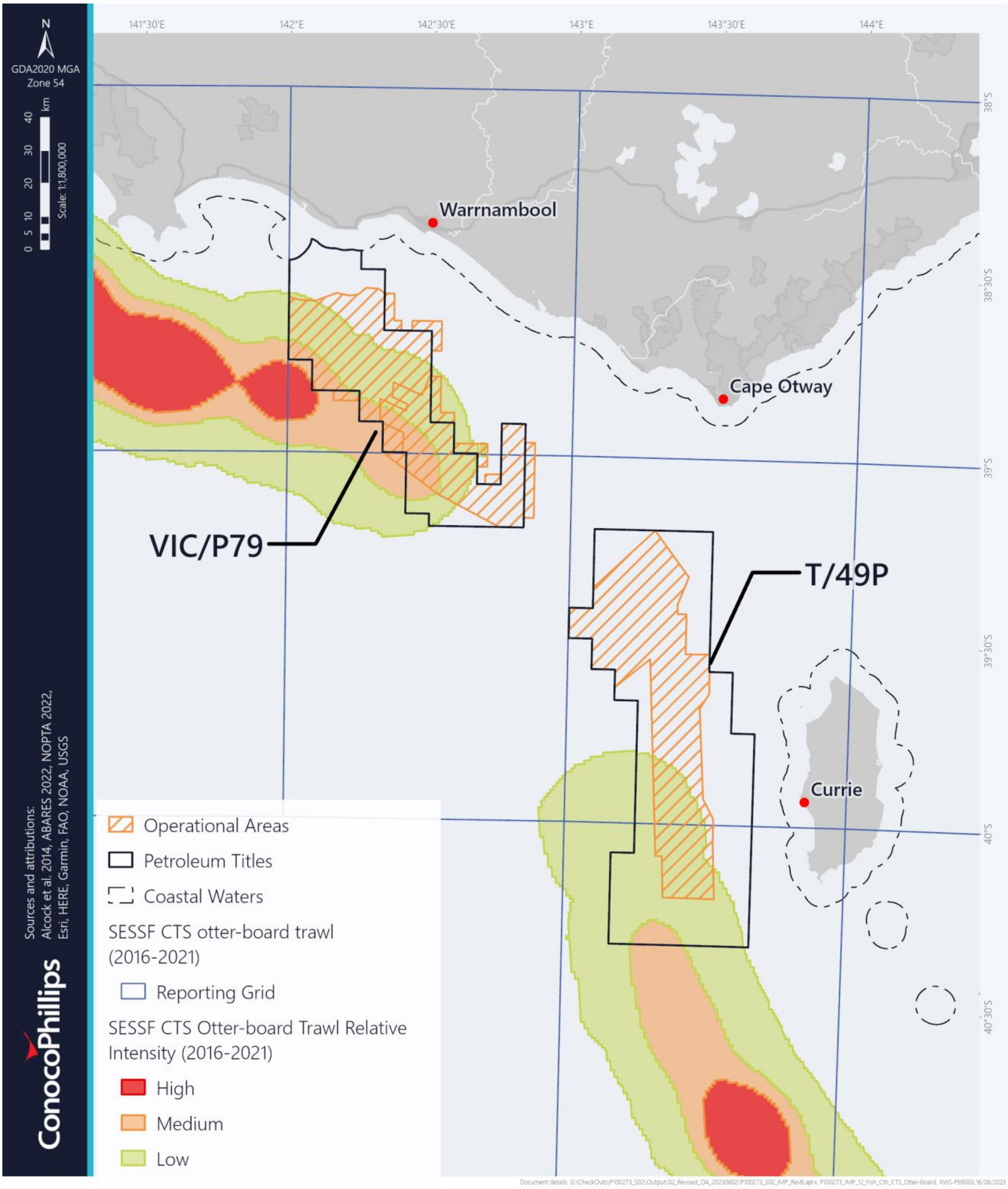


Figure 6-7: SESSF Commonwealth Trawl Sector (CTS) – Otter-board trawl intensity within the operational area

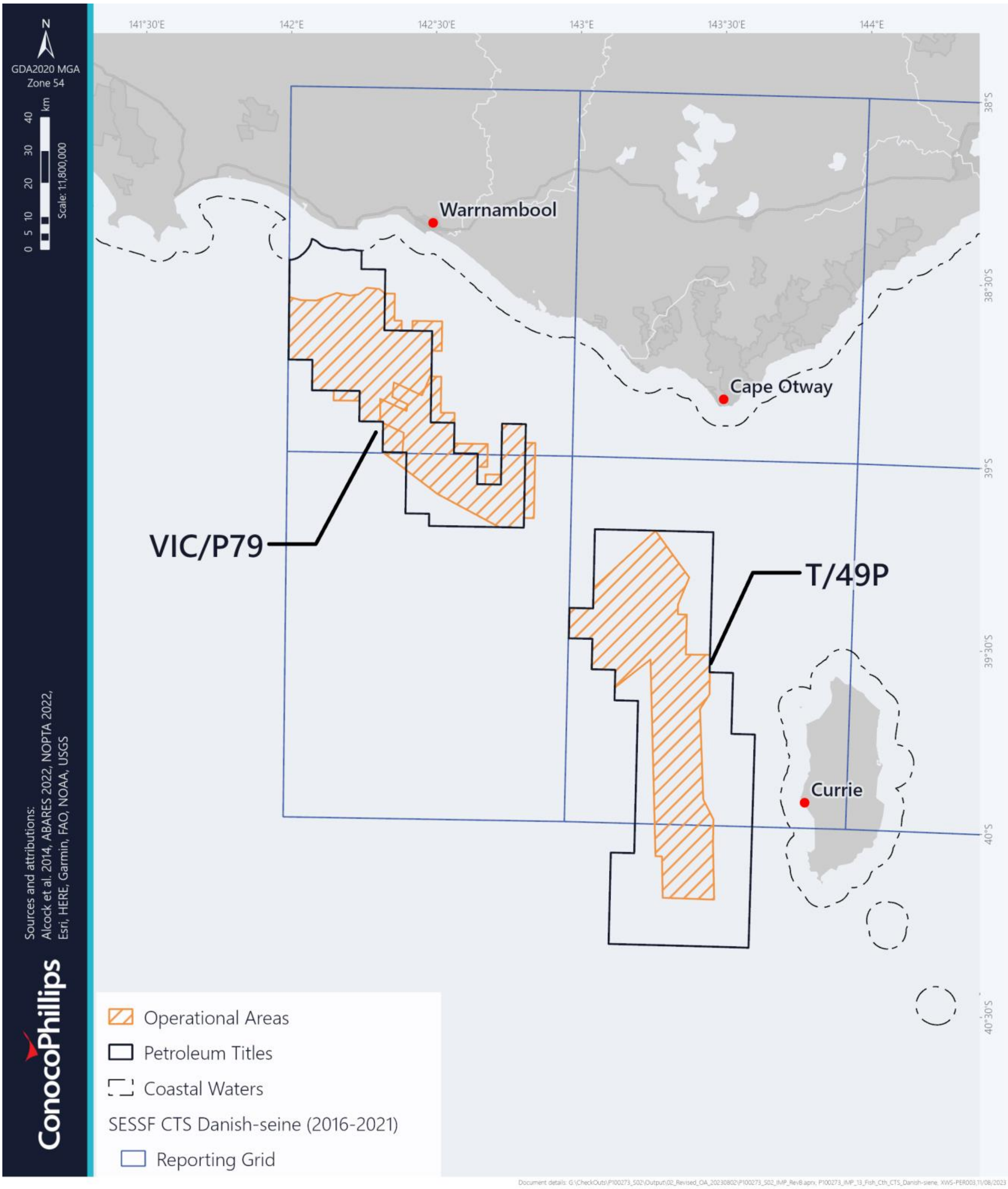


Figure 6-8: SESSF Commonwealth Trawl Sector (CTS) – Danish-seine intensity within the operational area

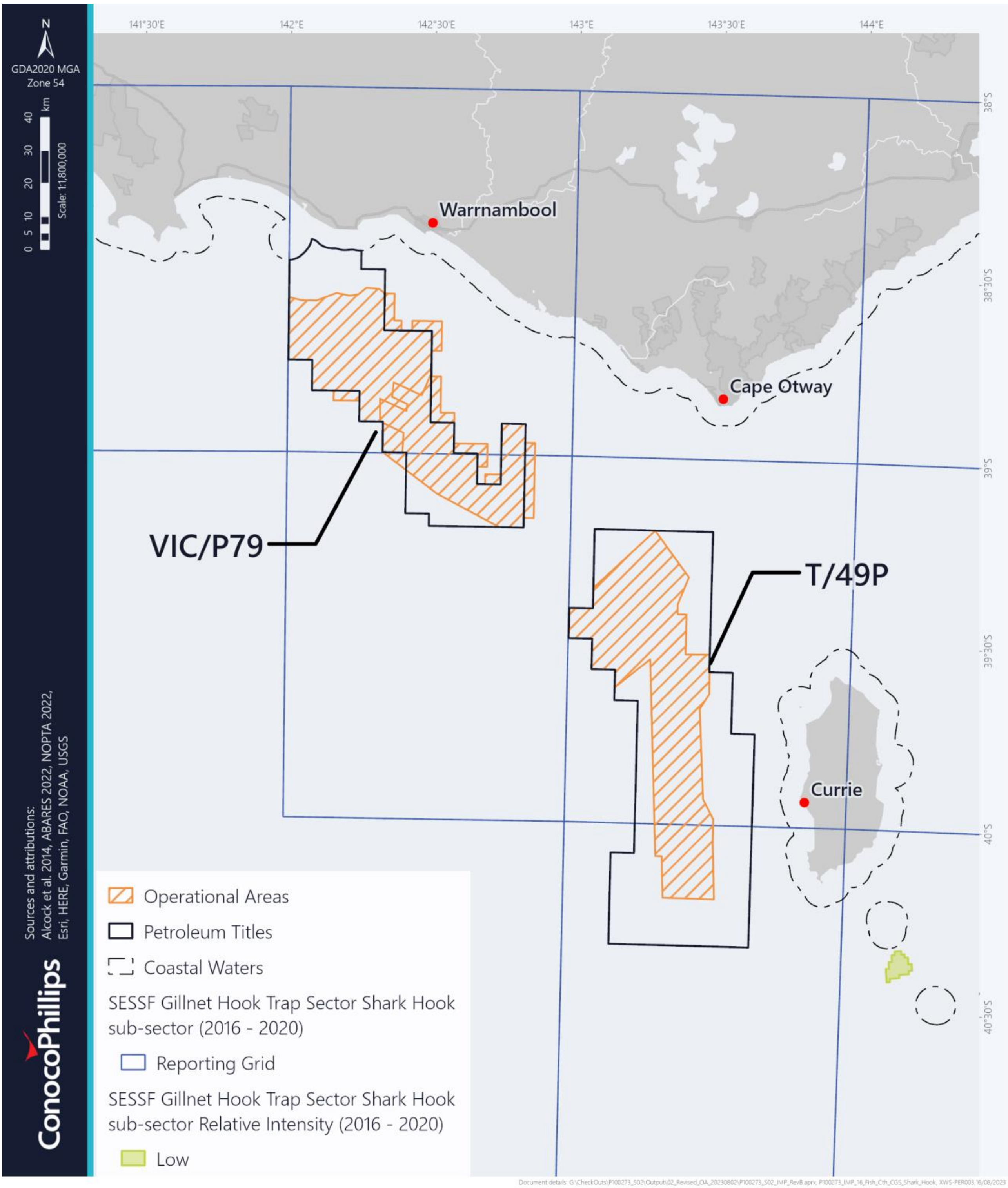


Figure 6-9: SESSF – Shark Hook Sector (CSHS) intensity within the operational area

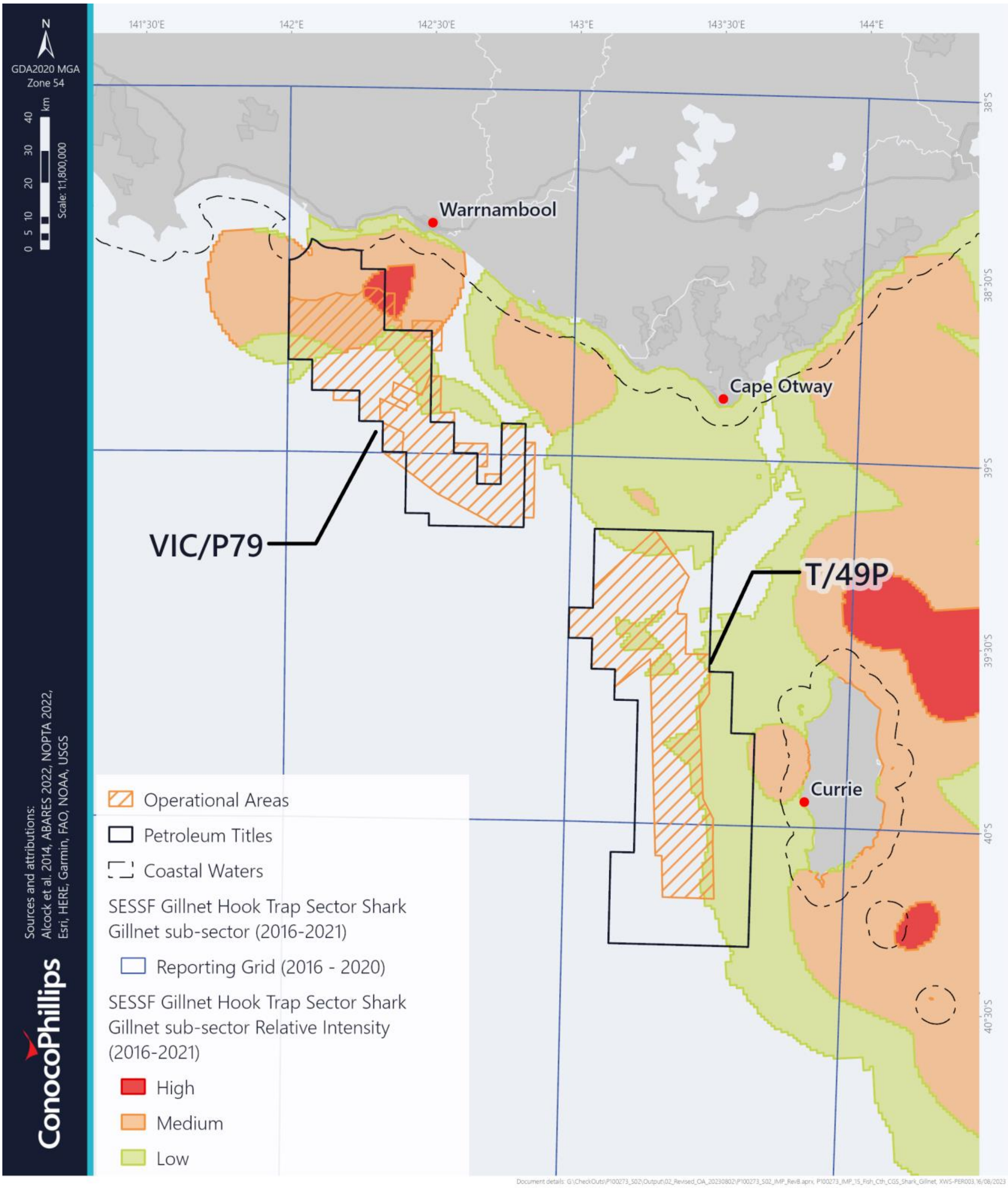


Figure 6-10: SESSF – Shark Gillnet Sector (CGS) intensity within the operational area

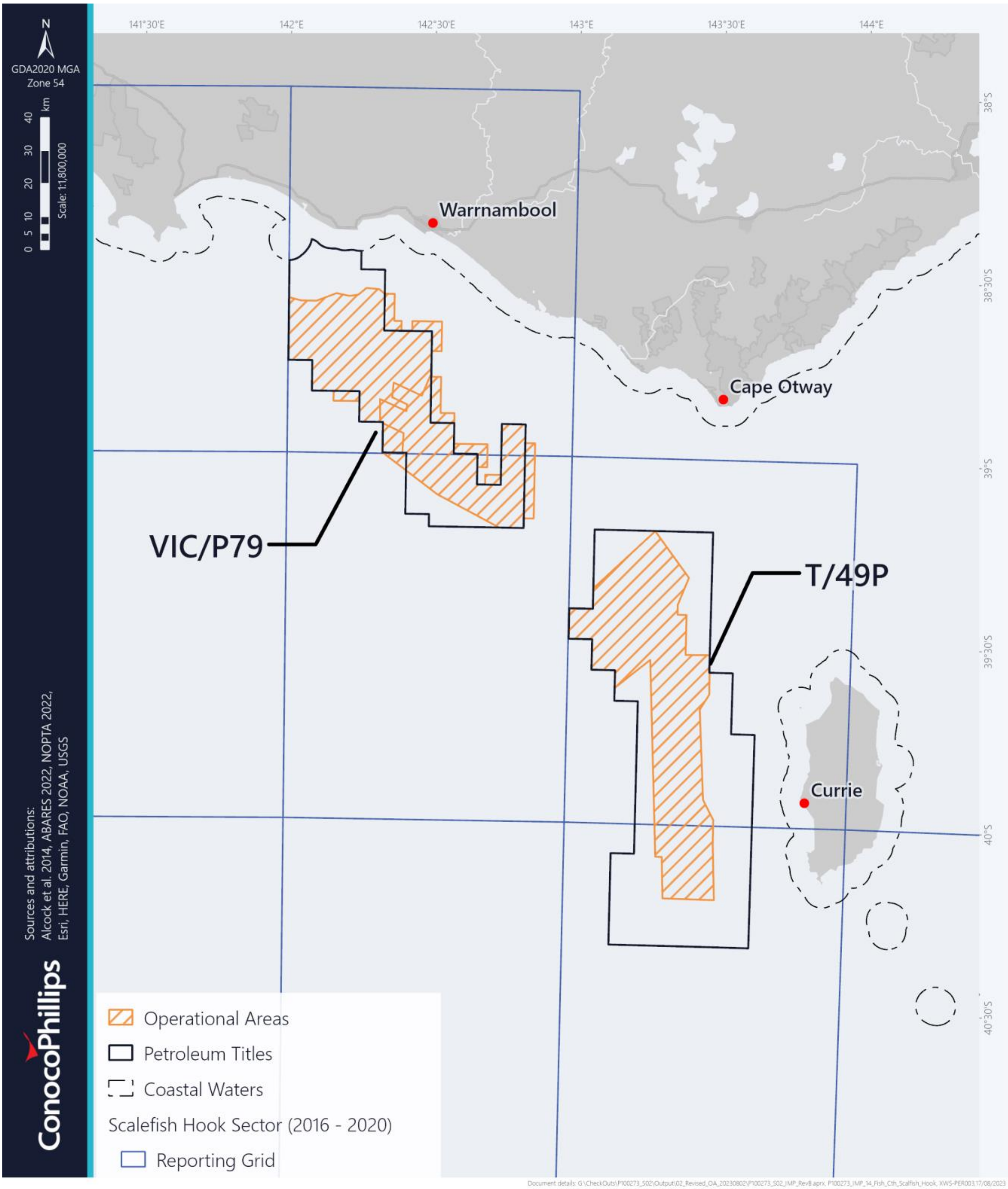


Figure 6-11: SESSF Scalefish Hook Sector (SHS) intensity within the operational area

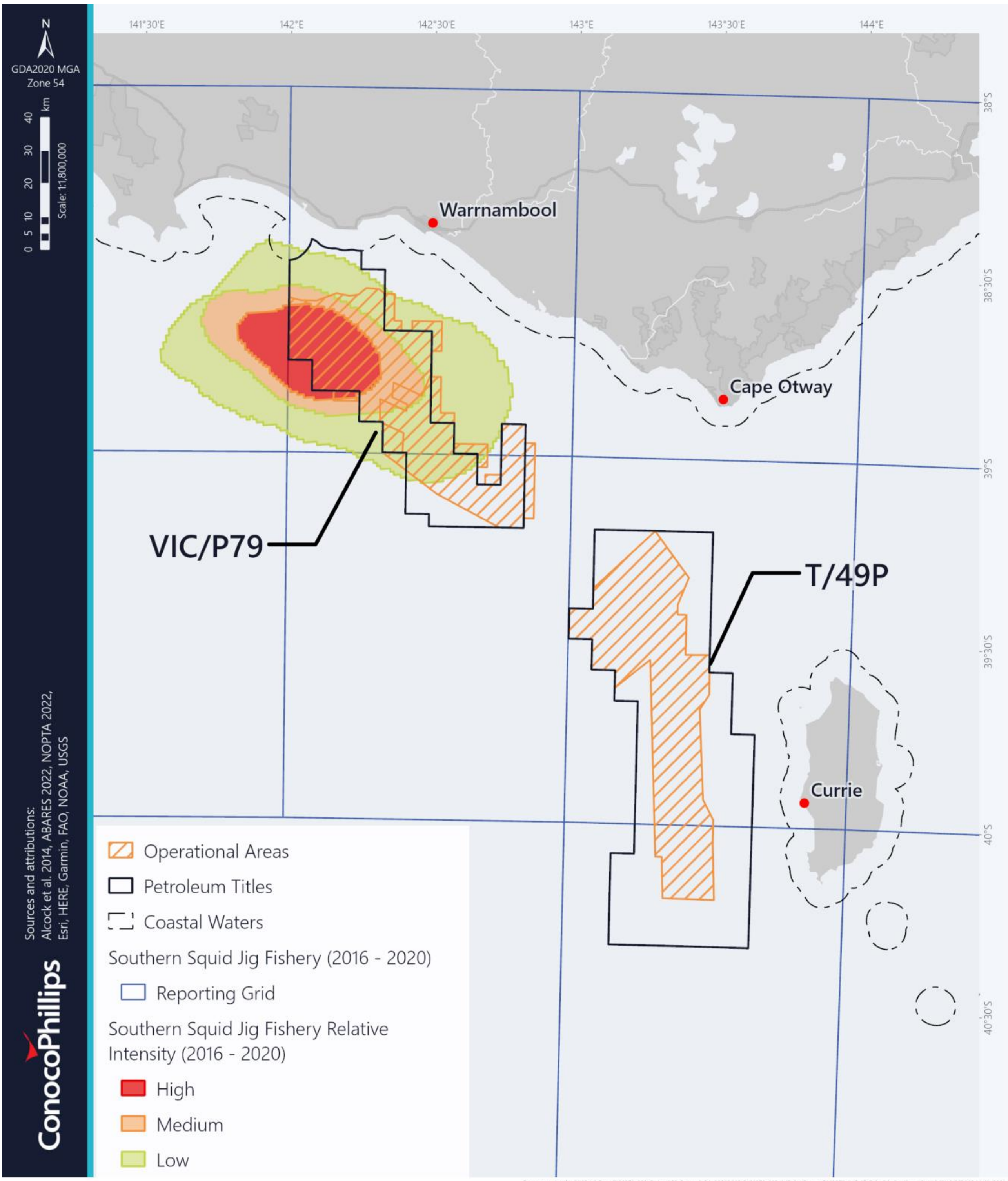


Figure 6-12: Southern Squid Jig Fishery (SSJF) intensity within the operational area

Victorian Fisheries

Victorian fisheries are managed by the Victorian Fisheries Authority (VFA). VFA jurisdiction extends offshore to 3 nautical miles. By agreement with the Commonwealth, the VFA also manages some fisheries beyond this limit.

For Victorian managed fisheries that actively fish within the operational areas, information is provided consisting of catch and effort data supplied by the VFA with additional information from the SETFIA report undertaken for the Sequoia Marine Seismic Survey (SETFIA and Fishwell Consulting 2020).

Table 6-3 details the fishery seasons and highest fishing intensity for the Victorian fisheries that have catch effort within the operational area.

Table 6-3: Indicative Victorian commercial fishery seasons and catch intensities

Fishery		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Giant Crab	Fishery – males												
	Fishery – females												
	Highest catch* rates (CPUE)												
Southern Rock Lobster	Fishery – males												
	Fishery – females												
	Highest catch rates (CPUE)												
Green = Fishery Open. Yellow = Fishery Closed. Red = Highest catch rates													

*Unreported due to low number of operators (<5). Tasmanian fishery catch, which is highest December to February and lowest from June to October (based on Mills et al. 2006), is provided to support analysis.

Source: Mills et al. 2006; VFA 2022; SETFIA and Fishwell Consulting 2018; 2020.

Rock Lobster Fishery

The Victorian Rock Lobster Fishery management area is shown in Figure 6-13. The operational areas lie within the 'western zone' of this fishery defined as the area between Apollo Bay and the Victorian/South Australian border. VFA (2022) data shows the greatest numbers of days fished are within reporting grids that are adjacent to the coastline. The highest reported value near the Victorian/South Australia border was 6,265 days fished between 2011 and 2021. Of all the operational areas, only the very northern section of the VIC/P79 operational area overlaps a reporting grid stating a value >163 days fished between 2011 and 2021. Reporting grid G10, which is only partially overlapped by VIC/P79 in the northern extent (16.2% overlap), reports 463 days fished for the period 2011 to 2021. Exploration activities are expected to have a minimal impact to fishers within the fishery.

Giant Crab Fishery

The Victorian Giant Crab Fishery has the same fishing boundaries as the Victorian Rock Lobster Fishery (Figure 6-14). The fishery targets Giant Crab (*Pseudocarcinus gigas*) using baited lobster pots in depths of 150 – 300 m (SETFIA and Fishwell Consulting 2020).

Since the introduction of quota management in the Giant Crab Fishery in 2001, there have been less than 5 dedicated fishers active in the fishery and up to 20 fishers annually reporting Giant Crab catch as by-product from Rock Lobster fishing (VFA 2021a). The greatest fishing intensity for the Giant Crab fishery occurs along the continental shelf at depths between approximately 150 to 300 m (SETFIA and Fishwell Consulting 2020) to the west of the operational areas. VFA (2022) data also shows reporting blocks with the greatest numbers of days fished are to the west of the operational areas with activities from the Otway Exploration Drilling Program expected to have a minimal impact to fishers within the fishery.

Multi-species Ocean Fishery

The multi-species ocean fishery is comprised of three relevant sub-sectors; Ocean fishery, Commercial permit fishery and the Octopus fishery (central and western zone). The primary target of these fisheries is typically the pale octopus (*Octopus pallidus*), however Maori octopus (*Macroctopus maorum*), gloomy octopus (*Octopus tetricus*) and a variety of other species may also be taken. The fishery is open year-round and allows for the use of a variety of methods. Historically the Octopus (eastern zone) fishery was included in this fishery; however, in August 2020 it was established as a standalone fishery. VFA (2022) data shows the greatest number of days fished occurring to the west of Portland and between Cape Otway and Cape Liptrap, outside of the operational areas. All reporting grids for the period 2011 to 2021 (VFA 2022) which overlap the operational areas are designated as confidential due to less than 5 vessels being present (Figure 6-15). Therefore, exploration activities are unlikely to impact fishers within the fishery.

Octopus Fishery

As previously mentioned, the Octopus (eastern zone) fishery was historically included in the Multi-species Ocean Fishery; however, in August 2020 it was established as a standalone fishery. The target species, pale octopus (*Octopus pallidus*), are found in bays and coastal waters in Victoria, South Australia, Tasmania and (less commonly) southern New South Wales. VFA (2022) data shows the majority of the fishing effort is to the east of the operational areas. Only two reporting grids overlap the VIC/P79 operational area in the northern extent. Data for these is confidential due to less than 5 vessels being present. Exploration activities are unlikely to impact fishers within the fishery.

Wrasse (Ocean) Fishery

The Victorian Wrasse (Ocean) Fishery is divided into three commercial management zones and extends along the length of the Victorian coastline and out to 20 nautical miles offshore, excluding marine reserves. The fishery targets multiple species of wrasse (Blue-throat wrasse (*Notolabrus tetricus*) saddled wrasse (*N. fucicola),* orange-spotted wrasse (*N. parilus*) primarily utilising hook and line methods. VFA (2022) data shows the greatest numbers of days fished are within reporting grids adjacent to the coastline (Figure 6-17). No reporting grids showing fishing activity overlap the operational areas, therefore, exploration activities are unlikely to impact fishers within the fishery.

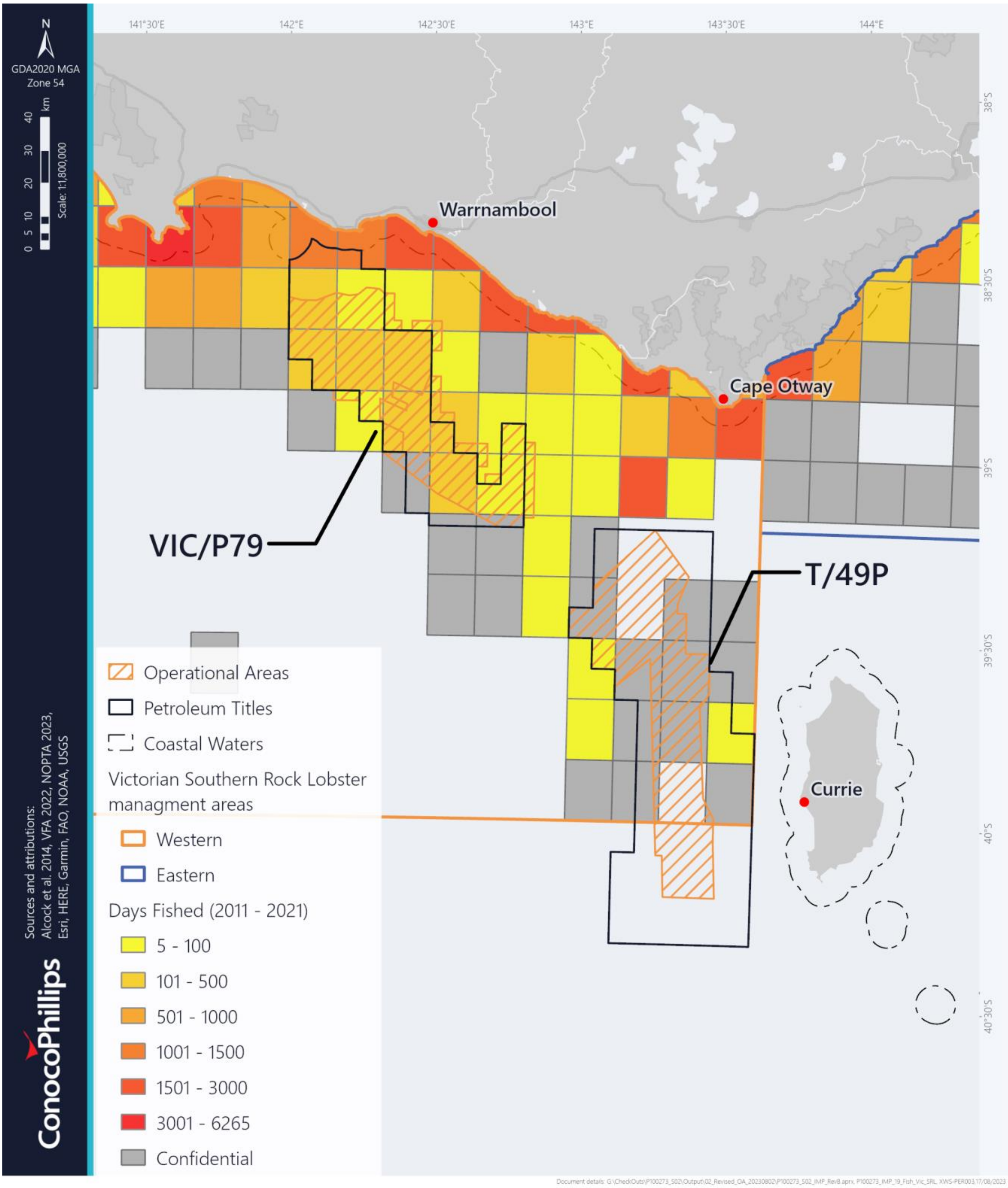


Figure 6-13: Victorian Southern Rock Lobster fishery and days fished within the vicinity of the operational areas

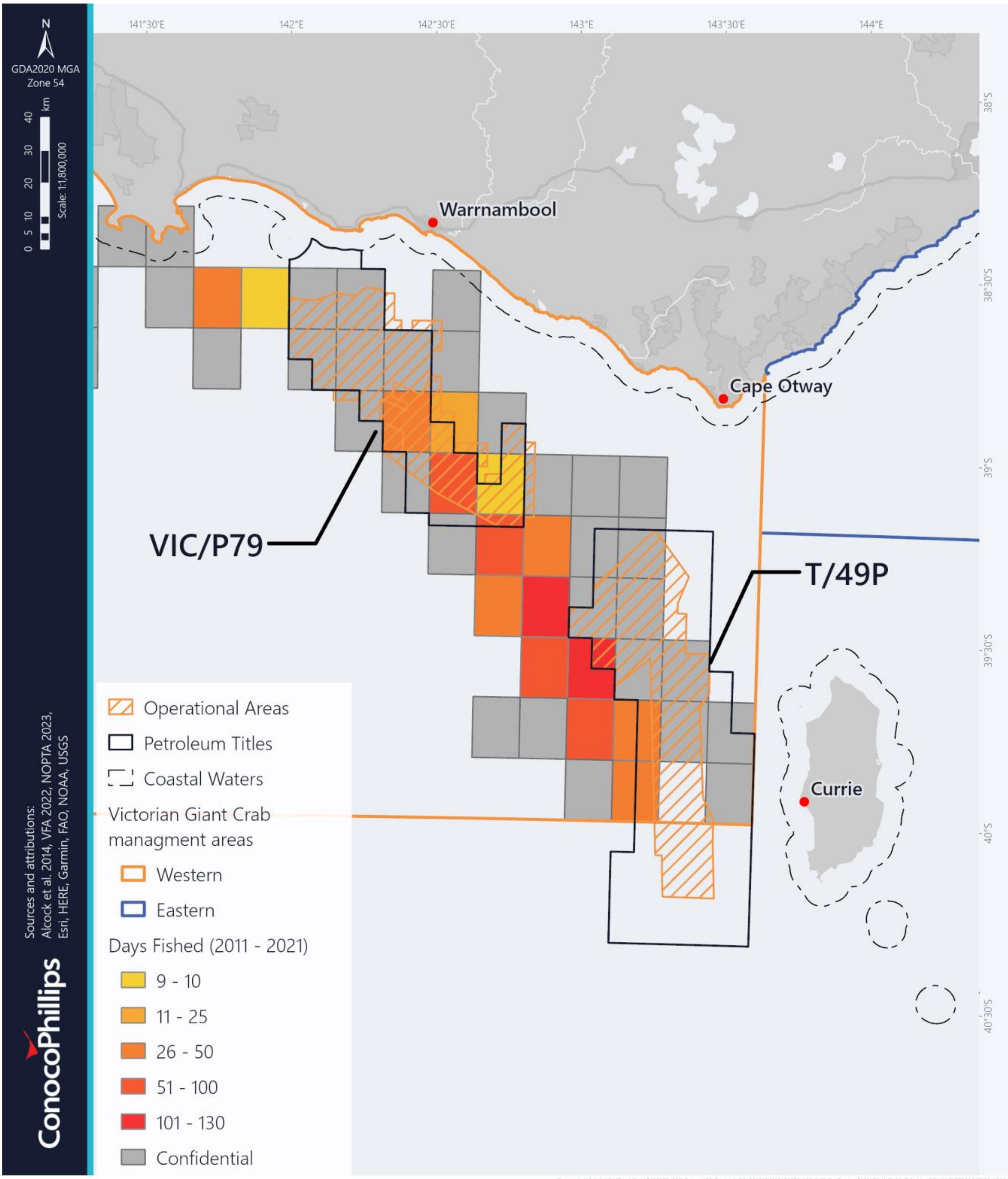


Figure 6-14: Victorian Giant Crab Fishery and active vessels within the vicinity of the operational area

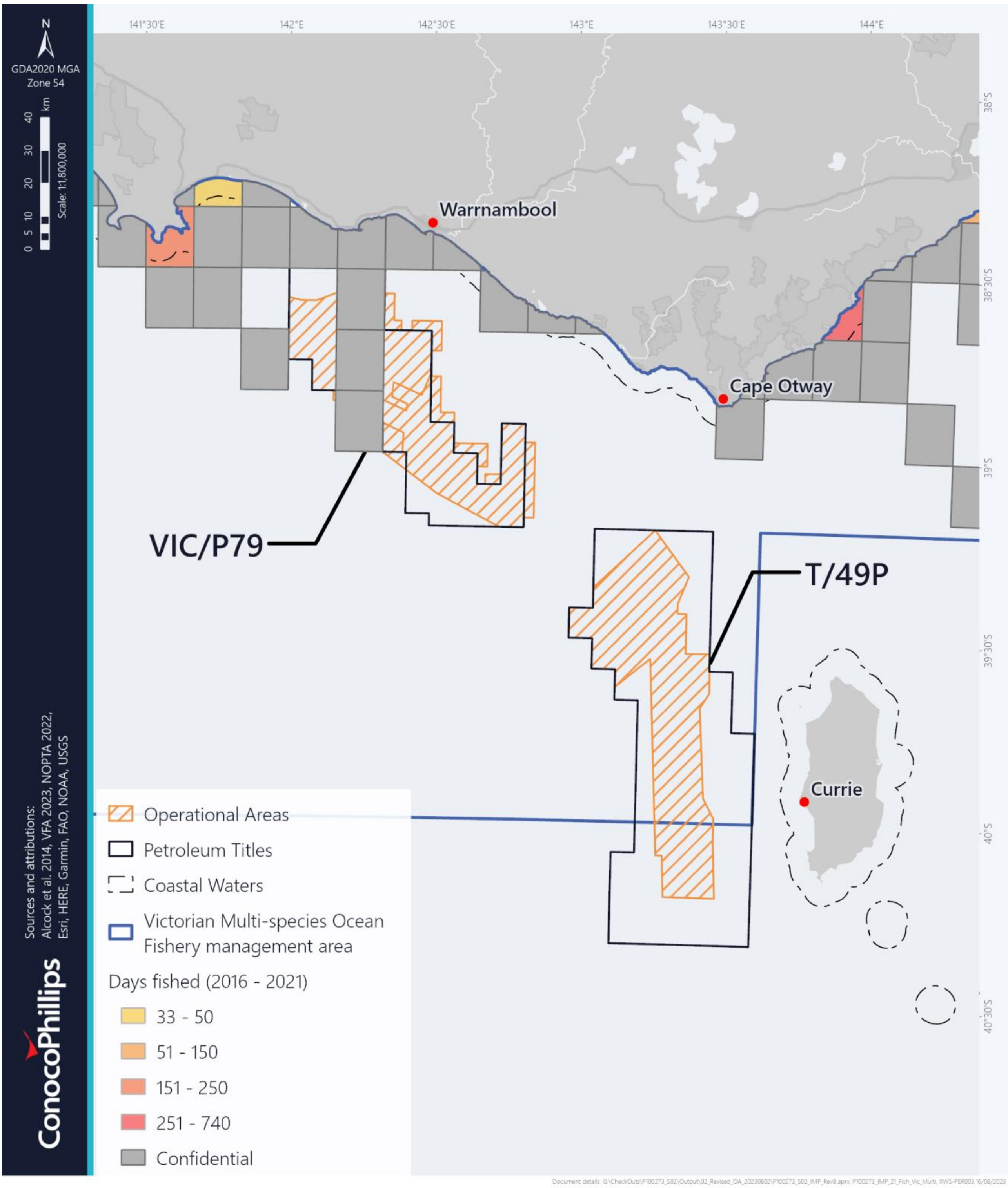


Figure 6-15: Victorian Multi-species Ocean Fishery and days fished within the vicinity of the operational area

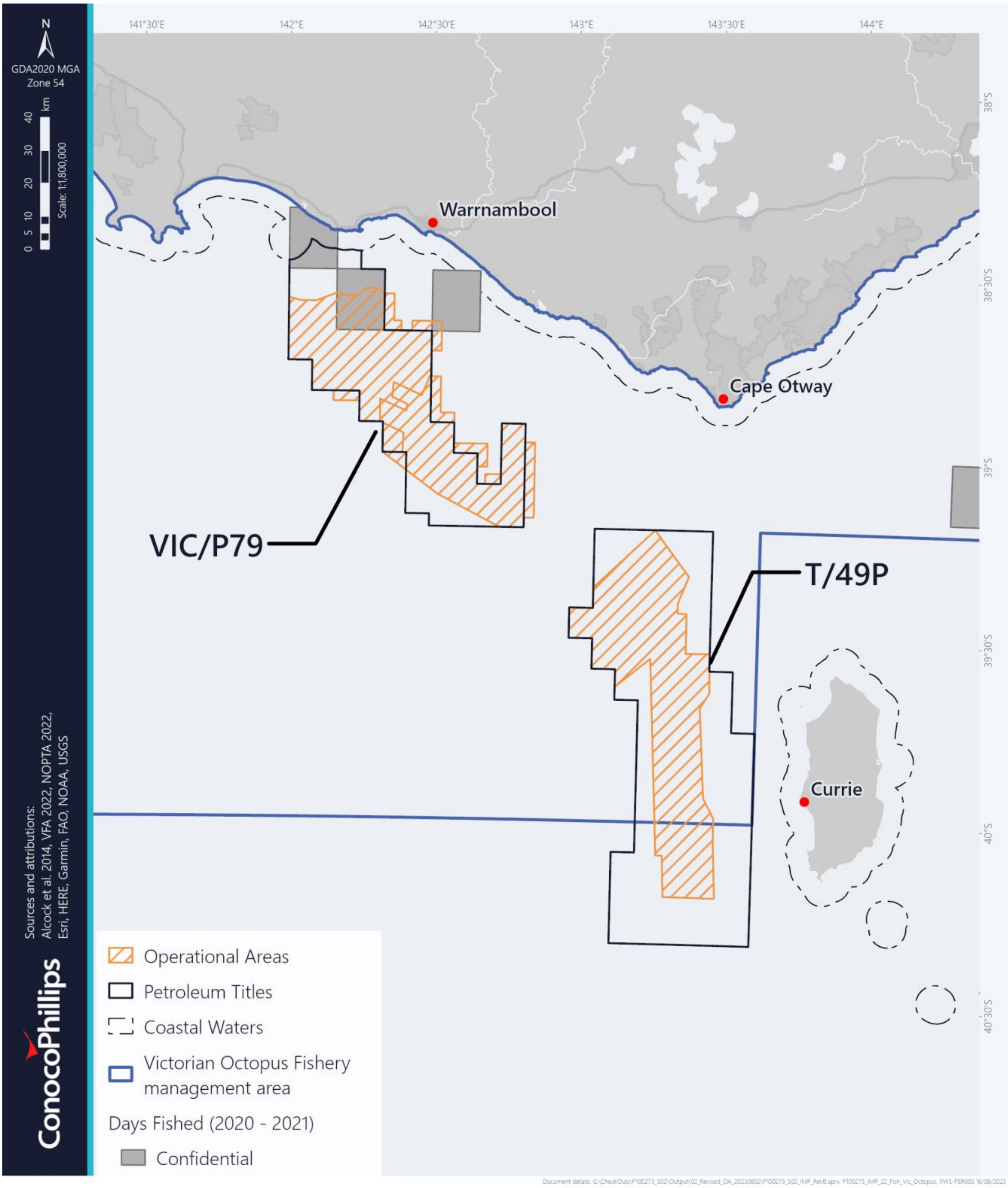


Figure 6-16: Victorian Octopus Fishery and days fished within the vicinity of the operational area

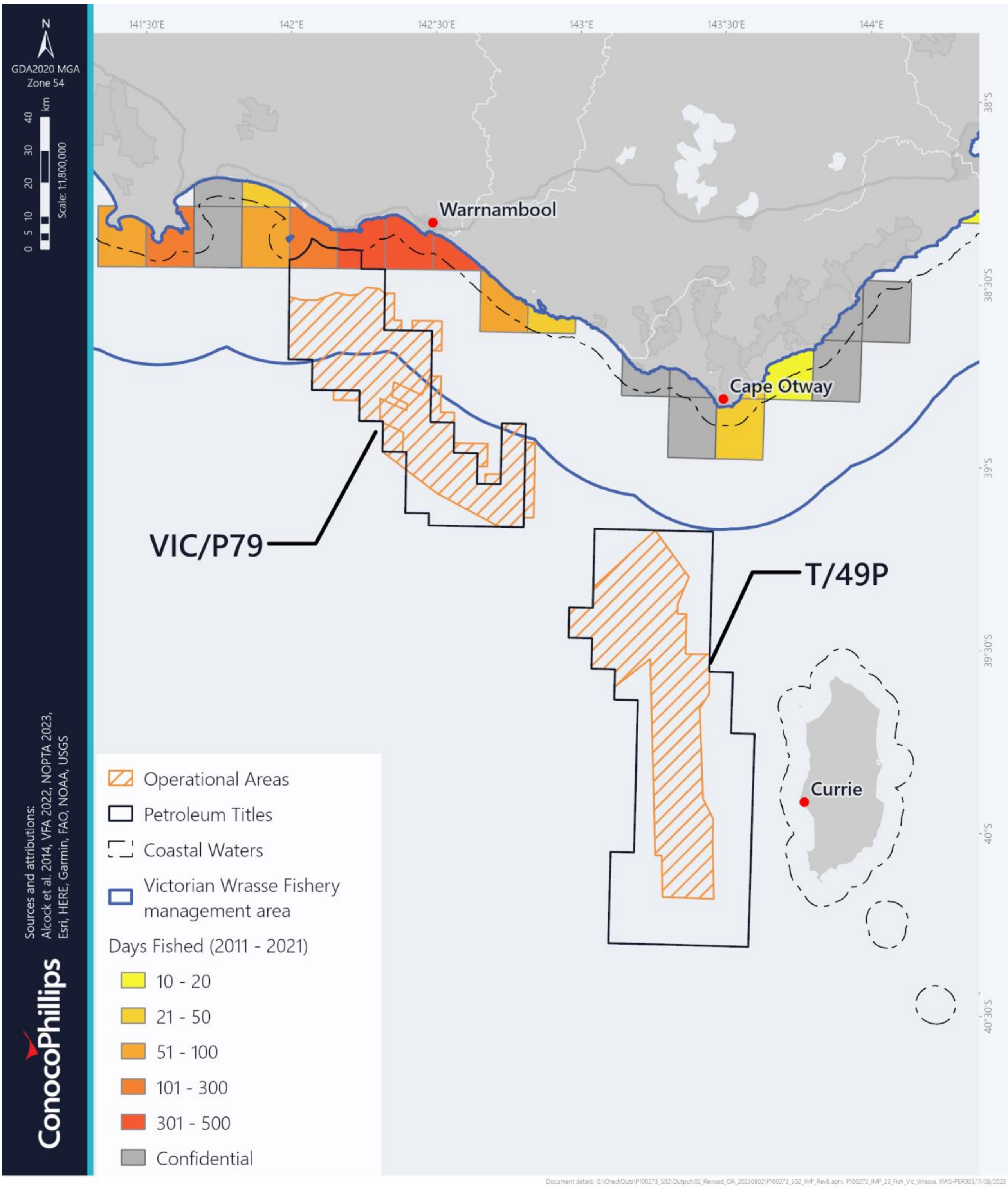


Figure 6-17: Victorian Wrasse (Ocean) Fishery and days fished within the vicinity of the operational areas

Tasmanian Fisheries

For Tasmanian managed fisheries that actively fish within the operational areas, information is provided consisting of catch and effort data supplied by the Department of Natural Resources and Environment Tasmania (DNRET). Additional data has also been sourced from the Fisheries Status Reports published by DNRET and the SETFIA report (SETFIA and Fishwell Consulting 2020).

Table 6-4 details the fishery seasons and highest fishing intensity for the Tasmanian fisheries that have catch effort within the operational area.

Table 6-4: Indicative Tasmanian commercial fishery seasons and catch intensities

Fishery		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Giant Crab	Fishery – males												
	Fishery – females												
	Highest catch rates (CPUE)												
Southern Rock Lobster	Fishery – males												
	Fishery – females												
	Highest catch rates (CPUE)												
Green = Fishery Open; Yellow = Fishery Closed; Red = **Highest catch rates**													

Source: DNRET 2022g; SETFIA and Fishwell Consulting (2020).

Rock Lobster Fishery

The fishery primarily targets the Southern Rock Lobster (SRL) (*Jasus edwardsii*) using baited lobster pots (SETFIA and Fishwell Consulting 2018). Most of the catch comes from 0 – 40 m water depths on coastal reefs; however, some catch is taken as deep as 200 m (SETFIA and Fishwell Consulting 2018). Whilst there is minimal vessel activity within the T/49P operational area, DNRET (2022) data shows the highest level of vessel activity occurs within coastal waters (Figure 6-18). As the majority of the fishing activity occurs outside of the operational areas, activities from the Otway Exploration Drilling Program are predicted to have a minimal impact on fishers within the fishery.

Giant Crab Fishery

Most fishing for the Tasmanian Giant Crab Fishery takes place on the edge of the continental slope (SETFIA and Fishwell Consulting 2018) (Figure 6-19). Whilst there is vessel activity within the T/49P operational area, DNRET (2022) data shows the highest level of vessel activity occurs along the continental slope outside of the operational area. As the majority of the fishing activity occurs outside of the operational areas, activities from the Otway Exploration Drilling Program are likely to have a minimal impact on fishers within the fishery.

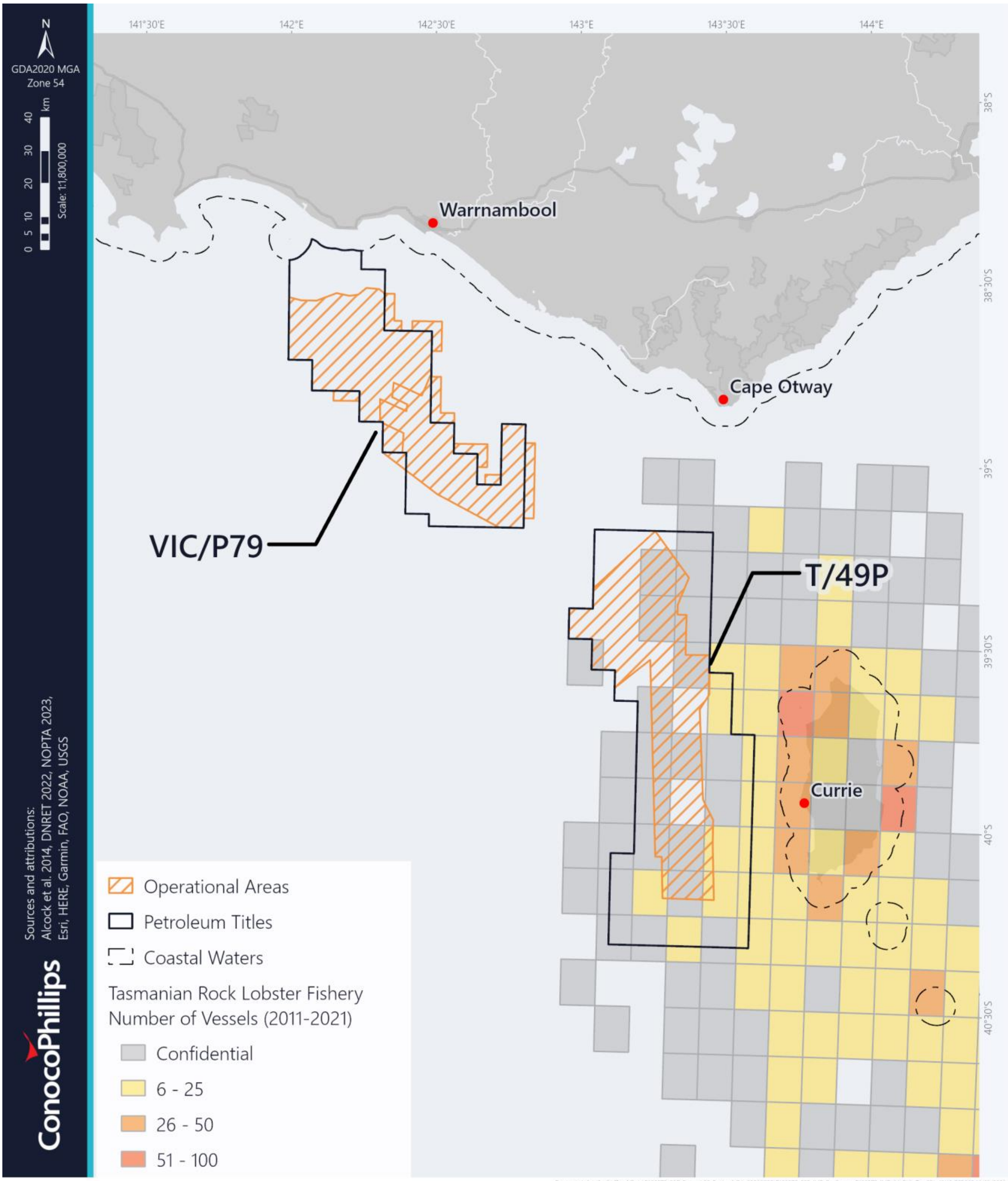


Figure 6-18: Tasmanian Southern Rock Lobster fishery and active vessels within the vicinity of the operational area

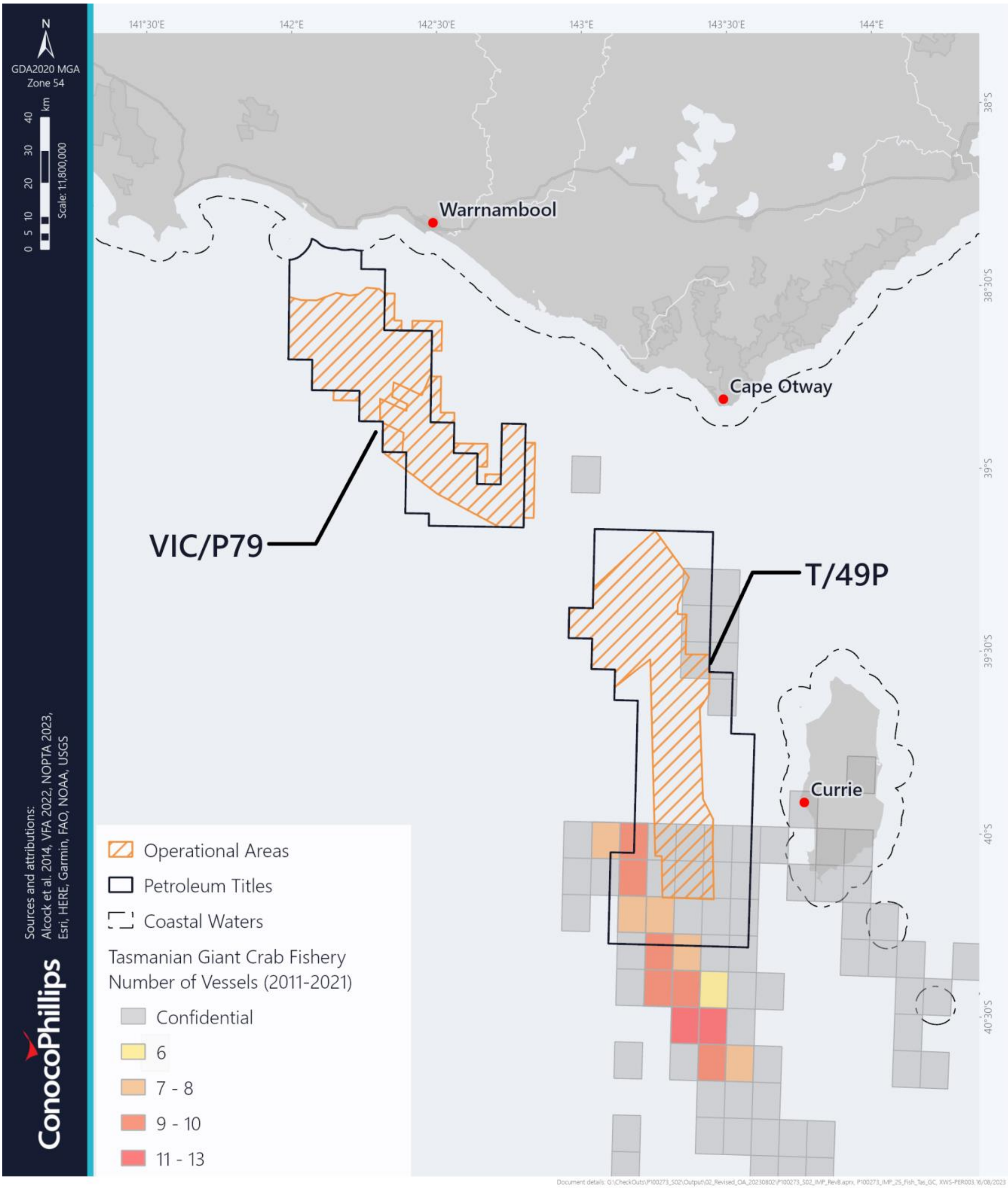


Figure 6-19: Tasmanian Giant Crab Fishery and active vessels within the vicinity of the operational area

6.2.4.8. Cultural Environment

As described in Section 4.8, the operational areas overlap with known cultural heritage values including maritime archaeological heritage and First Nations heritage.

Although there are known historical shipwrecks located within the operational areas (Figure 4-102) these will be avoided when determining the final drilling locations. Seabed surveys, conducted prior to drilling, will identify any seabed obstructions such as unknown maritime archaeological heritage, allowing appropriate mitigation measures to be adopted to ensure they are avoided. Subsequently, no impacts to maritime cultural heritage are expected.

The operational areas are located entirely in the offshore environment, known as Sea Country to First Nations people. Sea Country is important to First Nations people as it represents a connection to the environment and resources of the ocean.

6.2.5. Consequence Evaluation

6.2.5.1. Socio-economic Receptors

Recreation and Tourism

The presence of the MODU associated with the Otway Exploration Drilling Program may result in impacts to visual and aesthetic values of the area for residents and tourists, which may result in secondary adverse effects on the use of the area for tourism. The assessment of visual amenity is subjective with an individual's perspective of what constitutes an impact likely to vary from one individual to another.

Zone of Theoretical Visibility (ZTV) analysis (Appendix H) based on a 120 m high derrick on the MODU, and revised analysis for a lower derrick height of 84.1 m, predicts that the derrick could be visible from King Island when operating within the T/49P operational area. ZTV analysis based on a 120 m high derrick, and revised analysis for the likely lower derrick height of 84.1 m, predicts that the derrick could also be visible from the Victorian coastline when operating within the VIC/P79 operational area. However, given the distances between coastal observation points and the closest possible drilling areas within the VIC/P79 and T/49P operational areas are approximately 19 km and 28 km, respectively, the perceived size of the derrick would be minimal and will decrease with increased distance from coast.

ZTV analysis also predicts that the main deck of a MODU situated at either 40 m, or a revised height based on the likely MODU of 20.1 m above sea level, and vessels, could be visible from some elevated locations along the Victorian coastline when operating within the VIC/P79 operational area. For T/49P the main deck on the MODU could also technically be visible from elevated locations on King Island (Appendix H) based on both the initial 40 m and revised MODU deck height of 21.1 m. At these heights and distances it is possible that the main deck could appear just above the horizon depending on weather conditions.

The extent to which coastal recreation and tourism is likely to be affected by the visibility of the MODU derrick and deck and support vessels when in close proximity to the coastline is assessed as **Minor (2)** and is of a short-duration and fully recoverable with no long-term impacts to visual amenity or aesthetic values.

Commercial Shipping

The known and potential impact of interference with commercial shipping is:

- Diversion of third-party vessels from their navigation paths (resulting in longer sail times and greater fuel consumption).

The VIC/P79 operational area sits across the major east west shipping route in the Bass Straight. The seabed survey vessel, MODU and support vessels may encounter heavier concentrations of transiting commercial shipping when operating in the VIC/P79 operational area; however, Figure 6-2 shows that on average only 4.8 and 4.3 commercial vessels pass through the northern and southern extents, respectively, per day. The presence of the seabed survey vessel, MODU and support vessels during the Otway Exploration Drilling Program will be of a relatively short duration (a maximum of 90 days of drilling per well site, and approximately 1 week per seabed survey location). Therefore, interactions with commercial shipping are likely to be minimal.

All vessels involved with the Otway Exploration Drilling Program will adhere to the appropriate navigational requirements and prior notice of operations will be undertaken in the form of a Notice to Mariners. In addition, all vessels will display appropriate lights and shapes to reflect the nature of operations in compliance with the International Regulations for Preventing Collisions at Sea 1972 (COLREGS). Communications will be maintained with other marine users during operations.

The survey and support vessels will be travelling at slow speeds (approximately 4 - 5 knots) when undertaking seabed surveys (with a 500 m Safe Navigation Area (SNA)) or operating within the drilling area (a 2 km radius area around each drilling location) and will be highly visible to other marine traffic due to their size. In the unlikely scenario that survey vessels, the MODU or support vessels encounter merchant vessels, the inability of the MODU to move or the survey and support vessels to take sudden evasive action may require a third-party vessel to change course. This could amount to a detour for the commercial vessel of approximately 2 km to go around either the MODU or support vessels. If the vessel is transiting it is likely to be moving at a minimum of 20 knots (37 km/hr) thus it would take approximately 4 additional minutes to detour around the MODU or vessels. This is unlikely to result in a significantly longer sail time or increase in fuel use. Commercial shipping will be notified via a Notice to Mariners of when the activities will be undertaken allowing commercial shipping vessels to plan their transit to avoid increased travel time and distance.

The consequence severity of interference with commercial shipping is assessed as **Minor (2)** based on:

- Interference will be short-term and recoverable, with the predicted area affected to be limited to a 500 m radius SNA around seabed survey vessels and towed equipment, and a 2 km radius drilling area around each well site during drilling activities.
- During the seabed survey and drilling, commercial vessels would be required to deviate around the activities which is normal practice in a busy shipping area close to major ports and other oil and gas infrastructure.
- The location, timing and duration of Otway Exploration Drilling Program activities and any exclusion and/or cautionary zones will be communicated to mariners via Marine Notices and as part of ongoing consultation, and
- Vessels will be able to plan their journey to avoid the area and minimise interference.

Defence Activities

The operational areas are located outside of any Defence Training Areas and restricted airspace and will not impact on defence activities in the area. T/49P and the southernmost section of VIC/P79 operational areas are overlapped by a former firing range listed as Area 1052 - former air-to-air firing range. During consultation, ConocoPhillips Australia was advised that unexploded ordnance (UXO) may be present on and in the sea floor (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 157; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 121). Consequently, ConocoPhillips Australia commissioned a desktop study and risk assessment by RPS Explosives Engineering Services (RPS 2022) for both T/49P and VIC/P79 which assessed the risk of encountering UXO as Low, and the risk of Snag on Vessel as Moderate. Reactive mitigations recommended by RPS, including an explosives safety briefing and on-call explosives engineer, will be in place during the Otway Exploration Drilling Program.

Additionally, seabed surveys will be undertaken prior to drilling to assess the state of the seabed at potential drilling locations and anchoring positions. Seabed surveys will consist of visual, geophysical and geotechnical sampling techniques depending on rig and anchor specifications. Magnetometry, or similar, will also be conducted to identify ferric materials potentially associated with UXOs.

The extent of the area of impact assessment is within the operational areas, with the predicted impact to be within the seabed survey and drilling areas. The consequence severity of interference with defence activities was assessed as **Minor (2)**, and RPS independently determined the risk of UXO encounter as **Low** and the risk of Snag on Vessel as **Moderate** (using their in-house UXO risk assessment tool) based on:

- The location, timing and duration of Otway Exploration Drilling Program activities and any exclusion and/or cautionary zones will be well communicated to mariners via Marine Notices and as part of ongoing consultation.
- The risk of UXO encounter within the operational areas is assessed as Low, and
- The risk of Snag on Vessel, assessed as moderate, can be mitigated using reactive mitigations.

Commercial Fishing

The Otway Exploration Drilling Program has the potential to interfere with commercial fishing activities by the exclusion of commercial vessels from specific locations, through inadvertent damage to fishing equipment and as a result of loss of catch.

All seabed survey activities will be undertaken within a 500 m SNA around the vessel and any towed equipment, and MODU and support vessel activities will be undertaken within a 2 km radius (or 13 km^2) drilling area around the well location. A Notice to Mariners will be in place and pre-start notifications will be undertaken by ConocoPhillips Australia. Due to prior notice and the small area of operations, interactions with commercial fishing traffic are considered unlikely.

If commercial fishing vessels are transiting through the operational areas they may be required to detour around the activity which, for drilling, could amount to a detour of approximately 2 km. Transiting fishing vessel are likely to be moving at a minimum of 10 knots (18.5 km/hr), thus it would take approximately 10 minutes to detour around a drilling area. This is unlikely to result in a significantly longer sail time or increase in fuel use. Commercial fishers will be notified via Notice to Mariners and through pre-start notifications from ConocoPhillips Australia of where and when activities will be undertaken, allowing vessels to plan their transit to avoid increased travel time and distance.

Commonwealth commercial fishing data (ABARES 2021), for the period 2016 and 2021, shows that the operational areas only overlap with three fisheries where there is recorded intensity data, being the:

- SESSF – Commonwealth Trawl Sector (SESSF – CTS)
- SESSF – Gillnet Hook Trap Sector Shark Gillnet sub-sector (SESSF – CGS)
- Southern Squid Jig Fishery (SSJF)

The SESSF Commonwealth Trawl Sector otter-board trawl segment occurs primarily along the continental shelf (Figure 6-7). The VIC/P79 and T/49P operational areas overlap the combined five-year low intensity data by 2.45% and 0.84%, respectively, VIC/P79 overlaps the moderate intensity data by 1.45% and there is no overlap with areas of high intensity fishing. Additionally, there is no overlap between the operational areas and intensity data for the CTS Danish-seine sector.

The operational areas overlap the combined 2016 to 2021 five-year low, medium and high intensity data by approximately 1.37%, 0.64% and 0.20%, respectively, for the Gillnet Hook Trap Sector Shark Gillnet sub-sector (CGS) (Figure 6-7).

Whilst intensity data for the Southern Squid Jig Fishery (SSJF) for the period 2016 to 2021 shows a significant overlap with the operational areas, a single 2 km radius drilling area will have minimal potential for interference – overlapping each low, moderate or high intensity area by 0.26%, 0.8% and 0.8%, respectively (Figure 6-12).

The Otway Exploration Drilling Program is unlikely to have an impact to Commonwealth fishers given the limited overlap with areas of intensity data and, therefore, limited potential for interference.

Commonwealth commercial fishing data (ABARES 2021), for the period 2016 and 2021, also shows the operational areas intersecting with reporting grids for the following fisheries:

- Bass Strait Central Zone Scallop Fishery (BSCZSF)
- Eastern Tuna and Billfish Fishery (ETBF)
- Southern and Eastern Scalefish and Shark Fishery – Gillnet Hook Trap Sector Shark Hook sub-sector (SESSF – CSHS)
- Southern and Eastern Scalefish and Shark Fishery SESSF – Scalefish Hook Sector (SESSF – SHS).

As previously stated, a reporting grid (or block) shows the total area where fishing occurred at a resolution of one degree (approximately 111 x 111 km). Intensity data may not be displayed where <5 vessels operated in a block, as the data is considered confidential. Therefore, for the above listed fisheries, the number of vessels operating within each block will be limited and activity may have occurred anywhere within the block, i.e. inside or outside of the operational areas. Exploration activities are considered unlikely to interfere with these fisheries, given the low level of activity in the fishery reporting grids.

The operational areas intersects 32 of the 200 Victorian SRL fishery reporting blocks which have recorded fishing activity within between 2011 and 2021. Of these, only the very northern extent of the VIC/P79 operational area overlaps a reporting grid stating a value >163 days fished. Reporting grid G10, which is only partially overlapped by VIC/P79 in the northern extent (16.2% overlap), reported 463 days fished for the period 2011 to 2021. Most activity for the Victorian SRL fishing occurs in coastal areas.

In addition, the operational areas intersect with 29 of the 48 Victorian Giant Crab fishery reporting blocks which recorded vessel activity between 2011 and 2021 (Figure 6-14). However, most of the activity for this fishery occurs to the west of the operational areas along the continental shelf.

The operational areas have minimal overlap with the Victorian Multi-species, Wrasse and Octopus fisheries. The VIC/P79 operational area overlaps 3 of the 121 Victorian Multi-species Ocean fishery reporting blocks which recorded vessel activity between 2016 and 2021, all of which are marked confidential due to <5 vessels operating within them (Figure 6-15). The northern extent of the VIC/P79 operational area intersects with 2 of the 33 Victorian Octopus fishery reporting blocks which recorded vessel activity in 2021 (Figure 6-16). Data for both reporting blocks is confidential <5 vessels were present.

The T/49P operational area intersect 19 of the 797 Tasmanian Southern Rock Lobster reporting blocks which recorded vessel activity between 2011 and 2021. Data for 14 of these blocks is confidential as <5 vessels were present (Figure 6-18). Of the remaining eight blocks the operational area overlaps with values ranging from 1.3% to 25.6% with vessel numbers ranging between 5 and 12. Additionally, the operational area overlaps 14 of the 386 Tasmanian Giant Crab reporting blocks which recorded vessel activity between 2011 and 2021, all of which report <5 vessels (Figure 6-19). Due to the limited overlap, exploration activities are expected to have minimal interference with Tasmanian fishers.

Petroleum activities will be undertaken within the safe navigation area (SNA) and drilling area, as relevant to seabed survey and drilling activities, and are limited in duration. The consequence severity of interference with commercial fishers was assessed as **Minor (2)** given that:

- Interference will be short-term and recoverable, with the predicted area affected limited to a 500 m radius SNA around seabed survey vessels and towed equipment, and a 2 km radius drilling area around each well site during drilling activities.
- Diversion of commercial fishing vessels from their navigation paths potentially resulting in longer sail times and greater fuel consumption will be minimal.
- The location, timing and duration of exploration activities and any exclusion and/or cautionary zones will be well communicated to mariners via Marine Notices and during ongoing consultation.
- Vessels will be able to plan their journey to avoid the area and minimise displacement.
- Displacement of commercial fishers from fishing areas may result in longer sail times and greater fuel consumption; however, a change in catch is considered unlikely.

6.2.5.2. Cultural Environment

The operational areas are located entirely in the offshore marine environment, and therefore overlap Sea Country for the duration of the activity.

Interference with other marine and coastal users is assessed as having a **Minor (2)** consequence to socio-economic receptors and will be temporary, recoverable and small-scale. The ZTV assessment of visual aesthetics predicted that the derrick on the MODU would be visible from some locations along the Victorian coastline and from King Island, depending on where operations are occurring within each operational area. However, the perceived size would be minimal. The extent to which visual aesthetics is likely to be affected by the visibility of exploration activities is assessed as Minor (2) and is of a short-duration and is fully recoverable.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 35, Department of Energy Environment and Climate Action (DEECA) Event ID: 3242, FB ID: 273, 274; Org ID: 602, Event ID: 3269, FB ID: 343). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by interference.

The presence of the activity is therefore also predicted to have Minor (2) consequence to the cultural environment given the short duration, limited spatial extent, fully recoverable nature of visual-related impacts (with impact to seabed assessed in section 6.3) and controls in place.

6.2.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context A** has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower-order impacts are managed to ALARP and acceptable levels.

Table 6-5 documents the assessment of control measures and ALARP demonstration for Interference with Other Marine and Coastal Users.

Table 6-5: Control measures for interference with other marine and coastal users and ALARP assessment

Adopted Control Measures	
Control	**Source of good practice control measure**
CM01: Marine Assurance Process	ConocoPhillips Marine Assurance System ensures that the MODU and project vessels meet relevant maritime laws and includes pre-commencement vessel inspections of class certification requirements under the Navigation Act 2012 and associated Marine Orders, including but not limited to, Marine Order 27 (Safety of Navigation and Radio Equipment) 2016 and Marine Order 30 (Prevention of Collisions) 2009.
CM02: Vessel and MODU Operating Procedures	A 500 m radius Petroleum Safety Zone (PSZ) will be published in the Government Notices Gazette for each exploration well for the duration of the activity at each location. A 2 km radius Cautionary Zone will be monitored by support vessels around each exploration well for the duration of the activity at each location. A 500m radius Safe Navigation Area (SNA) will be monitored around the seabed survey vessels and any towed equipment. Vessel speeds will be restricted up to 5 knots within the drilling area except in emergency situations. AIS will be monitored 24 hours per day. Navigation and deck lighting will comply with appropriate legislation.

	One support vessel will remain on standby for the MODU.		
CM03: Marine and Coastal Users Consultation and Communication Plan	The plan includes a suite of measures to ensure that the outcomes of the NOPSEMA assessment are communicated to marine and coastal users and that during the activity relevant persons are informed about the progress of the activity and any changes. Specific notifications will be provided as follows, prior to vessel/MODU arrival in the operational area and on departure, so the maritime industry is aware of petroleum activities: • AMSA's Rescue Centre (ARC) (minimum two days prior) (Org ID: 8, Australian Maritime Safety Authority (AMSA) Event ID: 484, FB ID: 8, 9) • Australian Hydrographic Office (AHO) (minimum four weeks prior) (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 159; (Org ID: 8, Australian Maritime Safety Authority (AMSA) Event ID: 484, FB ID: 10) • Marine and Safety Tasmania (minimum 4 weeks prior and general updates) (Org ID: 10, Marine and Safety Tasmania (MAST) Event ID: 509, FB ID: 6, 63) • Other relevant Authorities (minimum one week prior) • Ocean Racing Club Victoria (Org ID: 510, Ocean Racing Club of Victoria (ORCV) Event ID: 2617, FB ID: 62) • 48-hour look-ahead provided every 24-hours prior to and during key periods of activity (i.e. transit of rig) (Org ID: 6, Tuna Australia, Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 473)		
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 35, Department of Energy Environment and Climate Action (DEECA) Event ID: 3242, FB ID: 273, 274; Org ID: 602, Event ID: 3269, FB ID: 343).		
Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Manage the timing of the operational activities to avoid peak marine and coastal user periods (e.g., fishing and tourism)	Would eliminate potential impacts to some marine users.	High cost in moving schedule due to MODU availability. Not considered feasible as marine and coastal users could potentially be in the area all year round. The area that users are excluded from is small (500 m to 2 km radii) when compared to the area available to other marine users and there is low marine user activity in the area as evidenced through fisheries data assessment and consultation.	Reject
MODU and/or vessel action to avoid other active marine users	Could eliminate interference with other users. However, the MODU does not have the ability to avoid others when drilling, and the survey vessels will be towing equipment that may affect their manoeuvrability. Note: Primary controls for Consultation and Communication Plan and Marine Assurance, including inspections of navigation and radio equipment, will minimise the likelihood of interactions.	The MODU has low manoeuvrability when in transit and needs to maintain station whilst drilling and is not able to move from its position. Evaluation of trade-offs indicates any movement off location significantly extends operational timeframes and associated impacts. The survey and support vessels may be able to manoeuvre away from vessels and are already required to avoid interactions with other marine users in accordance with safety protocols.	Reject
Fishing will not be permitted from vessels or the MODU	Reduce potential impacts to fisheries in the vicinity of the activity.	Negligible costs.	Adopt CM02: Vessel and MODU Operating Procedures
Establishment of research avoidance area	Establish avoidance area around research program in VIC/P79 to minimise risk of damage to/ loss of equipment (Org ID: 508,	The requirement will need to be communicated to vessel and MODU operators prior to commencement of	Adopt

	Blue Whale Society, Org ID: 528, Australian Oceanographic Services Pty Ltd, Event ID: 3194, FB ID: 239).	the activity and may result in increased fuel use and associated emissions t traverse around. Negligible cost.	CM02: Vessel and MODU Operating Procedures
Reduction			
Use of additional support vessels.	May further reduce the potential for interactions with other marine users, i.e. may support the management of interactions with more than one approaching vessel.	Evaluation of trade-offs indicates the use of additional support vessels increases impacts associated with emissions, discharges and underwater sound and collision risk to marine fauna. Costs would be disproportionate to the benefit and would increase impacts and risks.	Reject
Reduce the radius of exclusion zones around the MODU (2 km) and seabed survey vessels (500 m	Would reduce potential impacts to other marine users associated with displacement (shipping and fishing) as they would be excluded from a smaller area.	Evaluation of trade-offs indicates the increased risk of vessel collision or interactions with anchors/chains is not acceptable. Effort to implement would be grossly disproportionate to benefit given the location of the activity has low usage by commercial fishers and recreational vessels. Whilst commercial shipping traffic is present, it occurs in relatively low numbers daily with no vessel separation lanes present. The 500 m petroleum safety zone is a proscribed area (AMSA) and therefore cannot be reduced.	Reject
Anchor Buoy Management	Marking the position of the anchor buoys with a surface buoy and navigation light and this issuing of AUSCOAST Warnings will minimise the risk of interactions.	Benefits considered to outweigh costs.	Adopt CM06: MODU Mooring Plan
Mitigation			
Commercial Marine Operators Adjustment Protocol	An Adjustment Protocol will be developed in consultation with peak fishing associations and individual fishers to ensure that commercial fishers’ claims can be assessed and compensated. The protocol will also be developed in consideration of feedback from consultation with other marine users who identified they could be potentially impacted (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 474; Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 427-429; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 345; Org ID: 462, Mahina Bay Fishing Co Pty Ltd, Event ID: 3432, FB ID: 344; Org ID: 607, Event ID 2527: FB ID: 102; Org ID: 593, Event ID: 2512, FB ID: 168; Org ID: 50, Tasmanian Seafood Industry Council (TSIC), Event ID: 1821, FB ID: 152; Org ID: 433, Event ID: 2663, FB ID: 135; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 14; Org ID: 471 Richey Fishing Co Pty Ltd, Event ID: 536, FB ID: 12; Org ID: 490, Event ID: 507, FB ID: 3).	Benefits considered to outweigh possible high cost.	Adopt CM04: Commercial Marine Operators Adjustment Protocol
Safe Operations Guide	A Safe Operations Guide will be developed and implemented detailing pre-activity and on-water communication processes, including SMS messages and radio communication on Channel 16. The guide will be developed based on feedback from	Limited additional costs. Relevant Persons time required to communicate with ConocoPhillips Australia.	Adopt CM03: Marine and Coastal Users Consultation and

	consultation with other marine and coastal users during the preparation of the EP and adjustment protocol (see Event/FB IDs above).		Communication Plan
Fee-for-service arrangements for notifications during activity	Fee-for-service arrangement fishing association to send SMSs to the western distribution list with details of where and when seabed survey, anchor pre-lay and drilling activities are scheduled to occur and regular updates on progress and forecast plans, and what controls (cautionary and exclusion zones) will be in place at set intervals to increase knowledge of operations.	Limited additional costs.	Adopt CM03: Marine and Coastal Users Consultation and Communication Plan
Daily communication with relevant persons	May provide other relevant persons with daily updates on activities.	Does not reduce potential interference with other marine users who receive updates during relevant activities by other means (CM03). The effort required to contact all relevant persons on a daily basis is considered grossly disproportionate to the benefit gained. If requested during consultation, relevant persons will receive regular updates in line with CM03. A Notice to Mariners will be in place throughout the duration of the activity and vessels will be contactable on marine radio.	Reject
Explosives safety awareness briefing and on call access to explosives engineer	Increases awareness of potential to encounter UXO and provides access to technical support in the unlikely event of an encounter during the activity (Event ID: Org ID: 28, Department of Defence, Event ID: 540, FB ID: 157; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 121).	Limited additional cost.	Adopt CM02: Vessel and MODU Operating Procedures

Residual Impact Consequence Ratings	
Socio-economic Receptors	**Minor (2)**
Cultural Environment	**Minor (2)**

ALARP Statement	The decision context has been assessed as Type A and the residual consequence ratings are lower order - Minor (2). The adopted control measures minimise impacts from the presence of seabed survey vessel(s), the MODU and support vessels and are considered effective and appropriate to the temporary, small scale and reversible nature of the predicted environmental impacts. The adopted engineering, procedural and administrative control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific socio-economic and cultural values and sensitivities of the region and the functions, interests and activities of other marine and coastal users. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted impacts associated with interference from the Otway Exploration Drilling Program are reduced to ALARP.

6.2.7. Acceptability Assessment

Table 6-6 compares the predicted impact levels of Interference with Other Marine and Coastal Users against the defined acceptable levels.

Table 6-6: Comparison of defined acceptable levels with impact levels for interference with other marine and coastal users

<table>
<tr><th colspan="2">Defined Acceptable Levels</th><th colspan="2" rowspan="2">Predicted Impact Level</th><th rowspan="2">Is predicted impact below defined acceptable level?</th></tr>
<tr><th>Source</th><th>Level</th></tr>
<tr><td>Principles of ESD</td><td>Activities that result in temporary/ reversible, small scale and/or low intensity environmental damage.
Environmental impacts have a worst-case consequence ranking less than Major (4).</td><td colspan="2">Planned activities expected to result in Minor (2) impacts to other marine and coastal users.</td><td>Yes</td></tr>
<tr><td>Principles of ESD</td><td>Enough appropriate information to understand impact/risk of serious/ irreversible environmental damage.
Application of the precautionary principle in the presence of scientific uncertainty.</td><td colspan="2">There is high confidence in the prediction of impacts to other marine and coastal users.</td><td>Yes</td></tr>
<tr><td>Principles of ESD</td><td>EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.</td><td colspan="2">None relevant.</td><td>Yes</td></tr>
<tr><td>Biological</td><td rowspan="4">Undertake the activity in a manner that will not interfere with other marine and coastal users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
Commercial marine operators are not economically disadvantaged as a result of the Otway Exploration Drilling Program.</td><td colspan="2" rowspan="4">There is a Minor (2) consequence of temporary, reversible and small-scale interference which does not have the potential to result in long-term, serious or irreversible impacts.</td><td rowspan="4">Yes</td></tr>
<tr><td>Ecological</td></tr>
<tr><td>Economic</td></tr>
<tr><td>Cultural</td></tr>
<tr><td rowspan="2">ConocoPhillips Australia Policies</td><td>All reasonably practicable control measures have been adopted to reduce environmental impacts</td><td colspan="2">Adopted controls measures have been assessed to ensure that environmental impacts will be of an acceptable level throughout the exploration program. See Table 6-5.</td><td>Yes</td></tr>
<tr><td>Environmental impacts are consistent with environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).</td><td>Consequence</td><td>Minor (2)</td><td>Yes</td></tr>
<tr><td>Relevant Persons Consultation</td><td>Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons.
The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.</td><td colspan="2">Claims and objections relevant to other marine and coastal users have been considered (with more detail provided in Section 3). These include:
• Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 345 – Tasmanian wild fisheries
• Org ID: 550, Salty Dog Fishing Charters, Event ID: 1141, FB ID: 25 – Fishing Charters
• Org ID: 110, Surf Coast Shire Council, Event ID: 649, FB ID: 16; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 13 – Great Ocean Road
• Org ID: 508, Blue Whale Study, Org ID: 528, Australian Oceanographic Services Pty Ltd, Event ID: 3194, FB ID: 239 – Marine research in VIC/P79</td><td>Yes</td></tr>
</table>

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
		• Org ID: 28, Department of Defence, Event ID: 540, FB ID: 157, 158; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 121 – UXOs • Org ID: 8, Australian Maritime Safety Authority (AMSA) Event ID: 484, FB ID: 8, 9 – AMSA notifications • Org ID:28, Department of Defence, Event ID: 540, FB ID: 159; Org ID: 8, Australian Maritime Safety Authority (AMSA) Event ID: 484, FB ID: 10) – AHO notifications • Org ID: 10, Marine and Safety Tasmania, Event ID: 509, FB ID: 6, 63 – MAST notifications • Org ID: 510, Ocean Racing Club of Victoria (ORCV) Event ID: 2617, FB ID: 62 – Ocean Racing Club Victoria notifications • Org ID: 6, Tuna Australia Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia Event ID: 4526, FB ID: 473 – 48-hour look ahead • Org ID: 35, Department of Energy Environment and Climate Action (DEECA) Event ID: 3247, FB ID: 273, 274; Org ID: 602, Event ID: 3269, FB ID: 343 – Cultural heritage • Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 472, 474; Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 427-429; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 345; Org ID: 462, Mahina Bay Fishing Co Pty Ltd, Event ID: 3432, FB ID: 344; Org ID: 607, Event ID 2527: FB ID: 102; Org ID: 593, Event ID: 2512, FB ID: 168; Org ID: 50, Tasmanian Seafood Industry Council (TSIC) Event ID: 1821, FB ID: 152; Org ID: 433, Event ID: 2663, FB ID: 135; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 14; Org ID: 471, Richey Fishing Co Pty Ltd, Event ID: 536, FB ID: 12; Org ID: 490, Event ID: 507, FB ID: 3 – Adjustment protocol	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Maritime law dictates the standards that apply to interactions on the water between any vessels.	Yes
Acceptability Statement	Decision-type A impacts are considered acceptable if the requirements in Table 6-6 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4). Further to this, following completion of the impact assessment process, impacts to other marine and coastal users from survey vessel, MODU and support vessel operations are considered **acceptable** because: • Adherence to offshore regulations is well understood, i.e. Navigation Act 2012, AMSA orders, appropriate qualifications, notice to mariners, navigational lighting • Required shipping/commercial fishing deviations would be minor and thus have negligible impact on travel times or fuel use		

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
	• Consultation will ensure other marine and coastal users are informed of exploration activities • Exploration activities will only be visible for short durations when the MODU and vessels are in close proximity to the coast. The perceived size of the MODU and derrick will be minimal and will decrease with increased distance from coast, and • A commercial fishers' compensation protocol and safe operations guide will be developed and implemented based on feedback from consultation. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of interference on identified receptors. Although the impacts of interference with other marine and coastal users associated with the Otway Exploration Drilling Program meet the defined acceptable levels, the impacts may be successive, additive or synergistic when considered in relation to other significant activities or projects over temporal and spatial scales. As a result, the potential for cumulative impacts on other marine users has been assessed further in Section 8.		

6.2.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with interference with marine and other users from the Otway Exploration Drilling Program are:

- EPO1: Undertake the activity in a manner that will not interfere with other marine and coastal users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
- EPO2: Commercial marine operators are not economically disadvantaged as a result of the Otway Exploration Drilling Program.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

6.3. Seabed Disturbance

6.3.1. Hazards

Planned activities that occur during the Otway Exploration Drilling Program may result in seabed disturbance through various pathways, as summarised in Table 6-7 below.

Table 6-7: Pathways for seabed disturbance from planned activities

Activity	Description of pathway	Predicted impact footprint	Total for program
Seabed survey activities	Transponders will be mounted on the seafloor during geophysical survey positioning using sandbag anchors. A sandbag anchor will remain on the seabed after recovery of the transponder and cannot be recovered without the risk of entanglement. The bags are typically biodegradable and filled with inert materials.	Per seabed site (max. nine in total): Typical footprint of sandbag approximately 0.2 m^2.	1.8 m^2
	Geotechnical survey techniques (grab sampling, core sampling and penetrometer tests).	Per seabed site (max. nine in total): Up to 12 sampling locations per site are expected with an indicative total footprint of 0.072 m^2 per sampling location.	7.78 m^2
MODU activities	Anchors will be used to maintain position of the MODU during normal operations.	Per well (max. six wells): Up to 12 anchors (and associated chains), each anchor and chain having an indicative disturbance footprint of 500 m^2.	36,000 m^2
	Tethers to hold the BOP in place and subsea hydraulic units may be required in the event that a mudline closure device is installed.	Per well (max. six wells): four gravity teachers and two hydraulic units with a combined footprint of 90 m^2.	538.7 m^2
Drilling activities	Drilling of the surface hole section, including initial penetration of the seabed.	Per well: Approximately 0.67 m^2 footprint.	4 m^2
	Following P&A operations and confirmation of the permanent barriers, the wellhead is cut with the use of a mechanical cutting tool and removed below the mudline (approximately 1.5 m) leaving no remaining well infrastructure on the seabed. The cutting process produces metal shavings (swarf), some of which remain on the seabed.	Swarf is expected to settle immediately and will likely remain within the existing footprint created by top-hole section drilling (surface disturbance is referenced above).	Included in surface hole above
TOTAL for 6 wells and 9 seabed survey locations		0.037 km^2	

Drilling discharges (i.e. cement and drill cuttings) may be present up to 500m from the well and are described in Section 6.8.

6.3.2. Environmental Impacts

Seabed disturbance from the activities listed above can result in direct and indirect impacts to benthic habitats and assemblages, including:

- Injury / mortality to fauna from smothering or damage
- Change in water quality from sedimentation and turbidity
- Change in habitat, such as:
    - Temporary increase in sedimentation and turbidity
    - Permanent alteration of seabed habitat
    - Habitat smothering

6.3.3. Defining the Environment that May Be Affected (EMBA)

Table 6-8 describes the basis for defining the EMBA for seabed disturbance, including relevant sources of information and resultant spatial extent.

Table 6-8: Seabed disturbance EMBA definition

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
Seabed Disturbance	Operational Areas	Seabed disturbance estimated footprint based on Table 6-7.	Conservative estimation of the maximum spatial extent of activities on the seabed, accounting for seabed surveys, drilling and anchoring activities.	Smaller areas within the seabed survey and drilling area (2 km radius around each well location).

6.3.4. Identifying Sensitive Receptors

Values and sensitivities relevant to the EPBC Act and the Environment Regulations (as described in section 5.4.2) that may be affected by seabed disturbance, were identified to be:

- Values and sensitivities as part of the Commonwealth marine environment, and
- Other values including social, economic and cultural values.

Receptors impacted by seabed disturbance will be limited to the benthic invertebrates, sessile epifauna and associated benthic habitats located within each drilling area. Seabed survey and drilling areas will be located entirely within the broader operational areas.

Benthic habitat within the operational areas is a mixture of calcareous ooze, calcareous sand and silt and a mixture of mud and sand (see Section 4.6.1). Calcareous materials are characteristic of soft sediment habitats while sand silt and gravel are characteristic of sandy substrate habitats. In particular, the T/49P permit area contains linear reef features, which are disconnected and widely interspersed with sand. It is unlikely that extensive areas of rocky reefs or outcrops (where sponges, coral and more diverse fauna may be present) occur within the operational areas. The presence of wave-sculpted sediment and low-profile limestone pavement reef often inundated by sand has been identified in the Zeehan Marine Park, however limited habitat appears to be available for crevice-dwelling species such as the SRL (Barrett et al. 2023).

According to the Department of Primary Industries, Parks, Water and Environment (DPIPWE (2020a) very little is known of Tasmania's offshore marine ecosystems as there have only been limited surveys of benthic biota. However, it is known that unvegetated soft sediments (sand, mud and other unconsolidated substrates) are the dominant feature of the subtidal marine environment in Tasmania, comprising around 75% of the seabed in nearshore areas (Parsons 2011).

The Bass Strait region is known to consist of numerous marine invertebrates, sessile epifauna and other habitats. Studies by Wilson and Poore (1987) for the Museum of Victoria found the invertebrate diversity to be relatively high in southern Australian waters, despite patchy distribution of species and little evidence of any distinct biogeographic regions.

Benthic receptors likely to be present within the operational areas that may be impacted by seabed disturbance include:

- Benthic and filter-feeding epifauna (e.g. sponges, macroalgae, coral, bryozoans, molluscs, ascidians)
- Crustaceans (e.g. giant crabs, rock lobster)
- Echinoderms (e.g. urchins, sea cucumbers), and
- Annelids (e.g. polychaete worms).

Further details on benthic invertebrates and habitats are provided in Section 4.6.1.

Sea Country, like Country, is of First Nations cultural heritage significance. First Nations peoples make no distinction between the land and sea as they believe their rights and responsibilities to the earth are not bound by any one element. This connection extends far beyond the current shoreline out to the edge of the continental shelf. Although this area is now submerged, it had been occupied for thousands of years (Biosis 2023). Consequently, potential impacts to the cultural environment associated with seabed disturbance have also been assessed.

6.3.5. Consequence Evaluation

The extent of direct seabed disturbance is predicted to be 0.006 km^2 per well, or 0.037 km^2 in total, located entirely within the operational areas. Direct contact by anchors, anchor wires/chains, drilling wellhead and survey activities can damage seabed habitats and the associated benthic marine fauna and flora. Indirect impacts can result from increased turbidity and sedimentation within the water column, with information on additional sources of increased turbidity and sedimentation provided in Section 6.8. Impacts are predicted to be restricted to the sensitivities located on the seabed within or adjacent to the impacted area.

6.3.5.1. Ecological Environment

Benthic habitats and associated benthic fauna found within the operational areas may be vulnerable to seabed disturbance from direct and indirect impacts. Benthic habitats found within the operational areas include rocky reefs, sponge beds, unconsolidated sediment supporting bryozoans (IMAS 2017), and are found elsewhere within the region (see Section 4.6.1 for further details).

The biological impacts to benthic habitats and communities depends upon the equipment, footprint, seabed substrate, the frequency and the ecosystem's resilience (Watson et al. 2022). Furthermore, the recovery timeframe following seabed disturbance also varies on several factors, including the species and seabed substrate disturbed (Hiddink et al. 2017), the time of year, larval recruitment, and the local hydrodynamics (Dernie et al. 2003). There is limited information on the recovery of benthic habitats after the removal of anchors and other equipment.

During consultation, feedback was provided regarding impacts to the survival and reproductive success of lobsters associated with habitat loss (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 279). A study on the recovery of seabed following bottom trawling activities identified faster recovery times for coarse-sediment (sand) compared to fine-sediment regions (Hiddink et al. 2017). Dernie et al. (2003) identified that benthic community recovery time following physical disturbance in soft sediment habitats varied from 64 days for low intensity disturbances, up to 208 days following higher intensity disturbance. For Otway Exploration Drilling Program activities, it is expected that following the removal of anchors and other equipment, disturbed areas will recolonise quickly as impacted areas are small and the benthic habitat is consistent with the low intensity disturbances recovery period, as identified by both studies Hiddink et al. 2017, and Dernie et al 2003. Impacts are not expected to cause long lasting changes to population characteristics.

During anchoring activities, there is also the potential for soft sediments to be suspended into the water column, which may affect benthic communities through a decrease in water quality or light penetration near the seabed (NERA 2018). Given the hydrodynamics in open ocean areas, the area of decreased water quality is expected to be localised and temporary, as sediments would settle out of the water column relatively quickly. The seabed in the operational area likely consists of a sandy floor within an open ocean area thus impacts in relation to suspended sediments from benthic disturbance would be on a similar localised and temporary scale, or less, as identified by NERA (2018).

The consequence severity of seabed disturbance impacts to the ecological environment is assessed as **Minor (2),** based on:

- The area of impact is predicted to be small (0.006 km^2 per well location) compared to the extent of the distribution of the benthic habitats and associated benthic marine fauna found within the operational areas.
- The EPBC PMST report identified no threatened benthic species or ecological communities, critical habitats or BIAs relevant to the benthic environment within the operational areas.

- The impacts are expected to be temporary and localised, with the impacted area of seabed anticipated to return to pre-impacted state with no long-term effects to habitat, population characteristics or productivity, and
- Studies on benthic habitat and assemblages within the operational areas (Section 4) did not identify the area as unique, with similar benthic habitats found elsewhere in the region.

As such, seabed disturbance associated with the Otway Exploration Drilling Program is not predicted to impact marine ecosystem integrity or functioning.

6.3.5.2. Conservation Values and Sensitivities

The T/49P operational area partially overlaps the Zeehan Australian Marine Park (AMP). Should the final drilling locations be located within this conservation area, the impacts to the ecological environment described above could affect the values and sensitivities of this site.

During consultation, relevant persons provided feedback regarding impacts to the Zeehan Marine Park (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 348, 434; Org ID 524, Wilderness Society, Event ID: 3480, FB ID: 376, 383, 385, 386; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3785, FB ID: 357, 370; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 1992, FB ID: 82) and the lack of defined drilling locations making the assessment of impacts to the Marine Park difficult (Org ID 524, Wilderness Society, Event ID: 3480, FB ID: 376, 382; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3875, FB ID: 357, 370; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 1992, FB ID: 82). As explained in section 1.4 of the EP, ConocoPhillips Australia has undertaken to assess impacts to all potential drilling locations within the broader operational areas, including within the multiple use zone of the Zeehan Marine Park as detailed below.

The South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013) identifies the ecosystems, habitats, communities and sea-floor features associated with the Western Bass Strait Shelf Transition and Bass Strait Shelf Provinces as major conservation values for the Zeehan marine reserve. The Zeehan reserve includes a variety of seabed habitats, including exposed limestone, that support rich animal communities of large sponges and lace coral and other, permanently fixed, invertebrates on the continental shelf. The rocky limestone provides important habitats for a variety of commercial species, such as the Australia's giant crab (*Pseudocarcinus gigas*), and a nursery ground for blue warehou (*Seriolella brama*) and ocean perch (*Sebastes alutus*) (DNP 2013). However, a recent study commissioned by the University of Tasmania for Parks Australia found that the fractured limestone reef pavement in the Zeehan Marine Park was rarely undercut and therefore unsuitable for crevice-dwelling species such as the SRL (Barrett et al. 2023). The potential impact area (0.006 km^2 at each well) is small compared to the size of the AMP (19,897 km^2). Any impacts to ecological receptors, as described above, will be localised and short-term, and widespread changes to the marine environment are not expected. Subsequently, no changes (**Negligible (1)** consequences) to are predicted to the conservation values of the Zeehan AMP.

As previously stated, extensive areas of rocky reefs or outcrops (where sponges, coral and more diverse fauna may be present) are unlikely to be present in the operational areas, including within the Zeehan Marine Park which has been mapped by the University of Tasmania (Davey et al. 2022; Barrett et al. 2023) (Org ID 524, Wilderness Society, Event ID: 3480, FB ID: 384; Org ID: 593, Event ID: 2512, FB ID: 169). If, however, such substrates are identified during seabed surveys, the data will be used to support the design of future developments within the area.

6.3.5.3. Socio-economic Environment

Seabed disturbance has the potential to result in a change to benthic habitat and, subsequently, to associated benthic species. There are two commercially fished marine benthic invertebrate species which are present within the operational areas which could be indirectly susceptible to seabed disturbance: the giant crab, and the southern rock lobster (SRL). Benthic invertebrates (such as the giant crab and southern rock lobster) are mobile species and are generally less vulnerable than sessile taxa to sedimentation, as they are able to move to areas with less sediment accumulation or by more efficiently physically removing particles (Fraser et al. 2017).

The operational area intersects with 32 of the 200 Victorian and 19 of the 797 Tasmanian SRL reporting blocks, and 29 of the 48 Victorian and 14 of the 386 Tasmanian Giant Crab reporting blocks – all of which have recorded vessel activity with the last five years. It is noted that the operational areas overlap a high proportion of the Victorian Giant Grab fishery reporting blocks showing vessel activity. However, the majority of the fishing effort takes place outside of the operational areas along the continental shelf (Figure 6-14). Further, as stated by Barrett et al., it is unlikely that significant lobster fishing activities would be undertaken within the Zeehan Multiple Use Zone, overlapped by the T/49P operational area, due to the absence of suitable habitat across most of the shelf (2023).

The SRL fishery has a stock status listed as sustainable for Victoria, Tasmania and South Australia (FRDC 2020). The Giant Crab fishery has a stock status listed as sustainable for Victoria and South Australia and depleted for Tasmania (FRDC 2020; 2020a). The depleted stock status for the Tasmanian Giant Crab fishery is based on data obtain from 2013-2014, and there has been insufficient data for the fishery since 2013 to determine if the stock is recovering (FRDC 2020a).

Due to the spatial area of seabed which may be disturbed within the wider extent of available fishing grounds and the short duration of the activity, impacts to benthic species of commercial importance are predicted to be localised and insignificant at a population level.

Feedback was provided during consultation that operators with seawater intakes were concerned with increased sediment loads affecting nearshore areas (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 276, 304, 310-315; Org ID: 13, King Island Marine Research, Event ID: 547, FB ID: 218, 220, 221). Given the hydrodynamics in open ocean areas, the area of decreased water quality is expected to be localised and temporary, as sediments would settle out of the water column relatively quickly. Further, no impacts associated with turbidity are predicted at coastal locations or water intakes.

The consequence severity of seabed disturbance impacts on the socio-economic environment is assessed as **Minor (2),** based on:

- Giant crab and SRL are mobile species and are generally less vulnerable than sessile taxa to sedimentation, as they are able to move to areas with less sediment accumulation or by more efficiently physically removing particles (Fraser et al. 2017).
- Giant crab and SRL are not listed as threatened species under the EPBC Act.
- Giant crab and SRL fisheries in Victoria, and the SRL fishery in Tasmania all have a sustainable stock status (FRDC 2020; 2020a). Therefore, any minor consequence impact is unlikely to affect the productivity of either population.
- The area of impact is predicted to be small compared to the extent of the available and utilised commercial fishing area for both the Victorian and Tasmanian giant crab and SRL fisheries, and
- Seabed disturbance has not been identified as a threat to the sustainability of either commercial fishery.

6.3.5.4. Cultural Environment

As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the operational areas overlap Sea Country for the duration of the activity. Disturbance of the seabed has the potential to interfere with cultural heritage, being both maritime archaeology and First Nations values and sensitivities.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 35, Department of Energy Environment and Climate (DEECA), Event ID: 3247, FB ID: 273, 274; Org ID: 602, Event ID: 3269, FB ID: 343). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by seabed disturbance.

Seabed disturbance is assessed as having a **Minor (2)** consequence to the physical and ecological environments and **Negligible (1)** consequences to conservation values and sensitivities in offshore waters, with no long-term, regional or population level impacts predicted as described above. It is therefore predicted to have Minor (2) consequence to any associated cultural values within the operational areas with controls in place.

6.3.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context A** has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower-order impacts are managed to ALARP and acceptable levels.

Table 6-9 documents the assessment of control measures and demonstration of ALARP relevant to seabed disturbance.

Table 6-9: Seabed disturbance control measures and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
CM06: MODU Mooring Plan	Development of a MODU mooring plan to ensure: • The mooring spread and anchor locations is appropriate for the environment • Adequate tensioning of mooring is applied and maintained • Anchors are located within the 2 km radius drilling areas (within the operational areas) • Seabed relief and sensitive seabed features are considered. Seabed surveys will be undertaken prior to finalising MODU position and location of mooring equipment, and prior to installing or removing the wellhead. These details will inform the well location and minimise impacts to the benthic environment and sensitive receptors (Org ID 524, Wilderness Society, Event ID: 3480, FB ID: 382, 383, 386; Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 424). Legislative requirement: Section 572 of the OPGGS Act details the requirements for removal of property. Upon well abandonment, all subsea equipment shall be removed from sea floor, with wellheads cut below mudline and retrieved to surface. Retrieval of all mooring equipment from the sea floor within 3 months following the completion of the drilling campaign.
CM01: Marine Assurance Process CM02: Vessel and MODU Operating Procedures	Critical equipment on vessels and the MODU will be maintained in accordance with preventative maintenance system to ensure effective operation.
CM05: Cultural Heritage Protection Program	Data from seabed surveys will be provided to an appropriately qualified underwater archaeologist to identify cultural heritage values and sensitivities and inform protection priorities, measures and reporting (Event ID: 3247, Reg16b ID: 273, 274). A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Event ID: 4145, FB ID: 54, 57; Event ID: 3818, Reg16b ID: 402-413; Event ID: 3469, Reg16b ID: 346, 347; Event ID: 3269, Reg16b ID: 343; Event ID: 1657, Reg16b ID: 88).

Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination/Substitution			
No anchoring, i.e. use of MODU with Dynamic Positioning (DP) systems only (i.e. no anchors).	No anchoring of MODU and support vessels within operational areas eliminates seabed disturbance from anchor and chain drag/ placement.	Anchoring is required to position the MODU. Evaluation of trade-offs indicates use of DP alone for maintaining station is feasible, however, would lead to disproportionately higher continuous noise impacts to sensitive receptors.	Reject
Directional drilling with top-hole outside of Zeehan Marine Park (AMP) (Event ID: 3857, Reg16b ID: 357; Event ID: 3480, Reg16b ID: 386)	Eliminates seabed disturbance in the AMP during the exploration program.	Technically feasible, however cost is influenced by the distance required for directional drilling. The costs are considered grossly disproportional to the benefit gained for most of the spatial extent of the AMP. Evaluation of trade-offs indicates the additional time and cost to directionally drill from outside the AMP would lead to disproportionately increased impacts associated with emissions, discharges and noise. The sacrifices are considered grossly disproportional to the benefit gained for most of the spatial extent of the AMP, given the distances involved. [Updated in response to Matter: I27]	Reject
Reduction			
Use less or smaller anchors to reduce seabed disturbance	Minimises contact with seabed and resultant disturbance.	The number and size of anchors used will be determined by the rig contractor, metocean conditions and safety risks as evaluated in the mooring plan. Reducing the recommended number of anchors represents an unacceptable HSE trade-off that is grossly disproportionate to the benefit gained.	Reject
Mitigation			
Environmental monitoring of seabed prior to and after the petroleum activity	Monitoring would not result in any additional information beyond the seabed survey and mooring analysis. Therefore, no additional reductions in likelihood or consequence would occur.	Significant cost including HSE trade-off associated with the mobilisation of vessels and collection of high-resolution data required to accurately assign changes in the seabed to the petroleum activity. The control is considered grossly disproportionate to the benefit and does not reduce the likelihood or consequence of impacts to the seabed.	Reject
Retain seabed samples for further analysis (Org ID: 9, University of Tasmania (UTAS), Event ID: 43, FB ID: 7; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 382, 384, 387; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3785, FB ID: 357).	During consultation, the University of Tasmania requested that collected seabed samples be retain for analysis to improve understanding of the benthic environment in the Otway Basin.	ConocoPhillips Australia considers the cost and effort to retain samples collected during the seabed survey, with storage and transport for onshore analysis, to be reasonable and will include this in the procurement process for the seabed survey. The evaluation of trade-offs for processing onboard indicates restrictions with deck and personnel space, and associated HSE risks in the offshore environment. Consequently, ConocoPhillips Australia considers the sacrifices (costs, effort and HSE trade-offs) associated with offshore processing to be grossly disproportionate to the benefit gained.	Adopt CM11: Procurement Vetting Process (with onshore processing)

Residual Impact Consequence Ratings	
Ecological Environment	**Minor (2)**
Conservation Values and Sensitivities	**Negligible (1)**
Socio-economic Environment	**Minor (2)**
Cultural Environment	**Minor (2)**
ALARP Statement	The decision context has been assessed as Type A and the residual consequence ratings are lower order - Minor (2). The adopted control measures minimise impacts from seabed disturbance and are considered effective and appropriate to the temporary, small scale and reversible nature of the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and adopted where they were identified as practicable to implement and without grossly disproportionate costs or trade-offs. Therefore, the predicted impacts to receptors from seabed disturbance associated with the Otway Exploration Drilling Program are reduced to ALARP.

6.3.7. Acceptability Assessment

Table 6-10 compares the impact levels of seabed disturbance against the defined acceptable levels.

Table 6-10: Comparison of defined acceptable levels with impact levels for seabed disturbance

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
Principles of ESD	Activities that result in temporary/ reversible, small scale and/or low intensity environmental damage. Environmental impacts have a worst-case consequence ranking less than Major (4).	Planned activities are expected to result in **Minor (2)** impacts to relevant seabed habitats and species, with no changes (**Negligible (1)** consequences) to conservation values or sensitivities.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	No species with an EPBC threatened status, or habitat critical to their survival were identified within the operational areas that may be impacted by seabed disturbance. The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).	Yes
Biological Ecological Economic	No death or injury to listed threatened and migratory species resulting from the exploration program. No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.	There are **Negligible (1)** to **Minor (2)** consequences of temporary, reversible and small-scale impacts from seabed disturbance which do not have the potential to result in long-term, serious or irreversible impacts.	Yes

Defined Acceptable Levels		Predicted Impact Level		Is predicted impact below defined acceptable level?
Source	**Level**			
Cultural	Undertake the activity in a manner that will not interfere with other marine and coastal users to a greater extent than is necessary for the exercise of right conferred by the titles granted.			
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts.	Adopted controls measures as listed above have been assessed to ensure that environmental impacts will be of an acceptable level throughout the exploration program.		Yes
	Environmental impacts are consistent with environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).	Consequence	**Negligible (1)** to **Minor (2)**	Yes
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to seabed disturbance have been considered (with more detail provided in Section 3). These include: • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 279 – SRL habitat loss • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 276, 304, 310-315; Org ID: 13, King Island Marine Research, Event ID: 547, FB ID: 218, 220, 221 – Sediment impacts to SRL • Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 382, 383, 386; Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 424 – Using seabed survey data to minimise impacts • Org ID: 35, Department of Energy Environment and Climate Action (DEECA), Event ID: 3247, FB ID: 273, 274 – Analysing seabed survey data to identify cultural values and sensitivities • Org ID: 35, Department of Energy Environment and Climate Action (DEECA), Event ID: 3247, FB ID: 273, 274; Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • Org ID: 9, University of Tasmania (UTAS), Event ID: 43, FB ID: 7; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 382, 384, 387; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3785, FB ID: 357) – Analysis of seabed samples • Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 348, 434; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 376, 383, 385, 386; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3785, FB ID: 357, 370; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 1992, FB ID: 82 – Impacts to the Zeehan AMP		Yes

<table>
<tr><th colspan="2">Defined Acceptable Levels</th><th rowspan="2">Predicted Impact Level</th><th rowspan="2">Is predicted impact below defined acceptable level?</th></tr>
<tr><th>Source</th><th>Level</th></tr>
<tr><td></td><td></td><td>Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3857, FB ID: 357; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386 – Directional drilling
Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 384; Org ID: 593, Event ID: 2512, FB ID: 169 – Insufficient baseline data
Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 376, 382; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 3875, FB ID: 357, 370; Org ID: 111, Australian Marine Conservation Society (AMCS), Event ID: 1992, FB ID: 82 – Lack of drilling locations</td><td></td></tr>
<tr><td>International Standards, Industry Best Practice</td><td>Relevant international, national, and industry standards have been considered and where relevant applied in the EP.</td><td>API Recommended Practice 2SK: Design and Analysis of Station keeping Systems for Floating Structures (API RP, 2005

ISO 19901-7:2013 Station keeping systems for floating offshore structures and mobile offshore units (ISO 19901-7, 2013)

Legislative requirement: Section 572 of the OPGGS Act details the requirements for removal of property.</td><td>Yes</td></tr>
<tr><td>Acceptability Statement</td><td colspan="3">Decision-type A impacts are considered acceptable if the requirements in Table 6-10 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4).

Further to this, following completion of the impact assessment process, the impact of seabed disturbance considered acceptable because:
The area of impact, and therefore the scale of the impact, is predicted to be small
No serious or irreversible damage to benthic habitats is predicted
Impacts are predicted to be localised and temporary, without any long-term impacts to the productivity or viability of seabed associated populations
Given that no long-term population-level impacts on productivity or viability are predicted, seabed disturbance is not identified as, or predicted to be, a threat to the sustainability of commercial fisheries within the area, and
The impact of seabed disturbance is considered to be of an acceptable level given the existing condition and assimilative capacity of the receiving environment, and does not have the potential to result in long-term, serious, irreversible or cumulative impacts, with limited potential for successive, additive or synergistic impacts when considered in relation to other significant activities or projects over temporal and spatial scales.
The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of seabed disturbance on identified receptors.

Based on the above evaluation, impacts associated with seabed disturbance meet the defined acceptable levels.</td></tr>
</table>

6.3.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with seabed disturbance from the Otway Exploration Drilling Program are:

- EPO1: Undertake the activity in a manner that will not interfere with other marine and coastal users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO6: No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

6.4. Light Emissions

6.4.1. Hazards

The Otway Exploration Drilling Program will generate artificial light emissions from the following activities:

- Vessel and MODU (routine) operations
- ROV underwater operations (spot lighting), and
- Short-term flaring during well testing.

Navigational lighting is required on the deck and derrick of the MODU and on survey and support vessels to comply with maritime regulations (Appendix A) and deck lighting is required to ensure safe operating conditions throughout the drilling campaign.

Flaring operations are required as part of flow-back and well testing. There will be no more than 120 hours of flaring per well, which will occur over multiple short-term events (refer to the EP Description of the Activity in Section 2 for more details on flaring operations). Flow rates are predicted to be in the range of 8 MMscf to 20 MMscf per day but with a maximum up 40 MMscf per day, and will only occur in the event that hydrocarbons are discovered.

6.4.2. Environmental Impacts

Light emissions from the activities listed above have the potential to result in:

- Change in ambient light.

A change in ambient light can result in several potential impacts, these include:

- Change in fauna behaviour
- Injury/mortality to fauna
- Change to the functions, interests or activities of other users, and
- Change in aesthetic values.

6.4.3. Defining the Environment that May Be Affected (EMBA)

Table 6-11 describes the basis for defining the light EMBAs, supporting sources and resulting spatial extents.

For the light assessment, the identification of light-sensitive receptors was undertaken within the two light EMBAs (routine light 20 km and flaring light 50 km). These EMBAs cover routine light emissions from both the seabed survey and drilling activities from any location within operational area and light emissions from flaring from any location within the drilling areas.

Table 6-11: Light EMBA definitions

Aspect	EMBA	Basis of EMBA	Source	Spatial Extent
Emissions - Light	Routine Light	The National Light Pollution Guidelines for Wildlife (CoA 2023) state an environmental impact assessment should be completed if there is a sensitive habitat within 20 km of the petroleum activity. Light emissions are generated by artificial light on survey vessels, the MODU and support vessels, during the petroleum activity. The measurable change in light from ambient conditions is likely to occur at <20 km from the source; but due to difficulties with calculating light intensity in	The adoption of a 20 km buffer for considering important seabird habitat is based on the observed grounding of seabirds in response to a light source at least 15 km away (CoA 2023). Further, the CoA notes that seabird fledglings may be affected by lights up to 15 km away.	Operational area + 20 km radius (Figure 6-20)

Aspect	EMBA	Basis of EMBA	Source	Spatial Extent
		biologically relevant measurements, the distance in the Guidelines (CoA 2023) has been used.		
	Flaring Light	Based on an assessment of modelling results of comparative flaring scenarios (Appendix F), the distance to light levels equivalent to ambient light on a moonless clear night sky/new moon (<0.001 lux) generated from combined facility lighting and flaring from the MODU has been calculated as 50 km.	Based on an assessment of modelling results of comparative flaring scenarios (Appendix F), for the exploration campaign, the model predicted the combined facility lighting and flaring rate of 40 MMscfd during flaring.	50 km from drilling area (Figure 6-20)

6.4.4. Identifying Light-sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of impacts associated with light emissions, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values include social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

The National Light Pollution Guidelines for Wildlife (CoA 2023) recommends that an environmental impact assessment is undertaken for listed species where artificial light has been demonstrated to affect behaviour, survivorship or reproduction. In the context of the activity location, artificial light emissions may impact the following biological receptors to a level significant enough to require assessment in line with the National Light Pollution Guidelines for Wildlife (CoA 2023):

- Seabirds and shorebirds
- Marine turtles
- Ecological communities (conservation values and sensitivities)

The EPBC Act PMST reported the presence of 101 species of birds within the routine light and/or flaring EMBAs (Appendix B). Of these, 57 bird species have a EPBC threatened status, including 7 listed as Critically Endangered (curlew sandpiper (*Calidris ferruginea*), eastern curlew (*Numenius madagascariensis*), orange-bellied parrot (*Neophema chrysogaster*), swift parrot (*Lathamus discolor*), regent honeyeater (*Anthochaera phrygia*), King Island scrubtit (*Acanthornis magna greeniana*) and plains-wanderer (*Pedionomus torquatus*), with 35 listed as Vulnerable and 15 Endangered. Twenty BIAs for bird species have been identified within the light EMBAs (Figure 6-21 to Figure 6-24). Further, NRE Tasmania recommended that the impact of lighting on seabird species be considered as lighting is known to disorientate birds, increasing likelihood of collision, and cause disruption to foraging (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 51).

The EPBC Act PMST report lists 3 species of marine turtles with the potential to occur within the routine light and/or flaring light EMBAs (Appendix B). All have an EPBC threatened status, with two listed as Endangered (loggerhead turtle (*Caretta caretta*) and leatherback turtle (*Dermochelys coriacea*)) and one listed as Vulnerable (green turtle (*Chelonia mydas*)). The EPBC Act PMST reports did not identify any known BIAs, nesting or inter-nesting areas identified as habitat critical to the survival of marine reptiles within the light EMBAs.

Conservation values and sensitivities (such as marine protected reserves and threatened ecological communities), socio-economic receptors (such as coastal communities), and the cultural environment – which have values that may be affected by an increase in light emissions from exploration activities – have also been evaluated by light modelling (Appendix F).

During consultation it was identified that the bogong moth could overfly the operational area and light EMBA (Org ID: 553, Australian Parents For Climate Action (North Tas and Surf Coast), Event ID: 3257, FB ID: 342; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 435). However, there is no evidence of a permanent larval population in Tasmania (as detailed in section 4.6.11) and, consequently, impacts to the bogong moth associated with routine operational lighting and short-term flaring are not predicted and have not been assessed further.

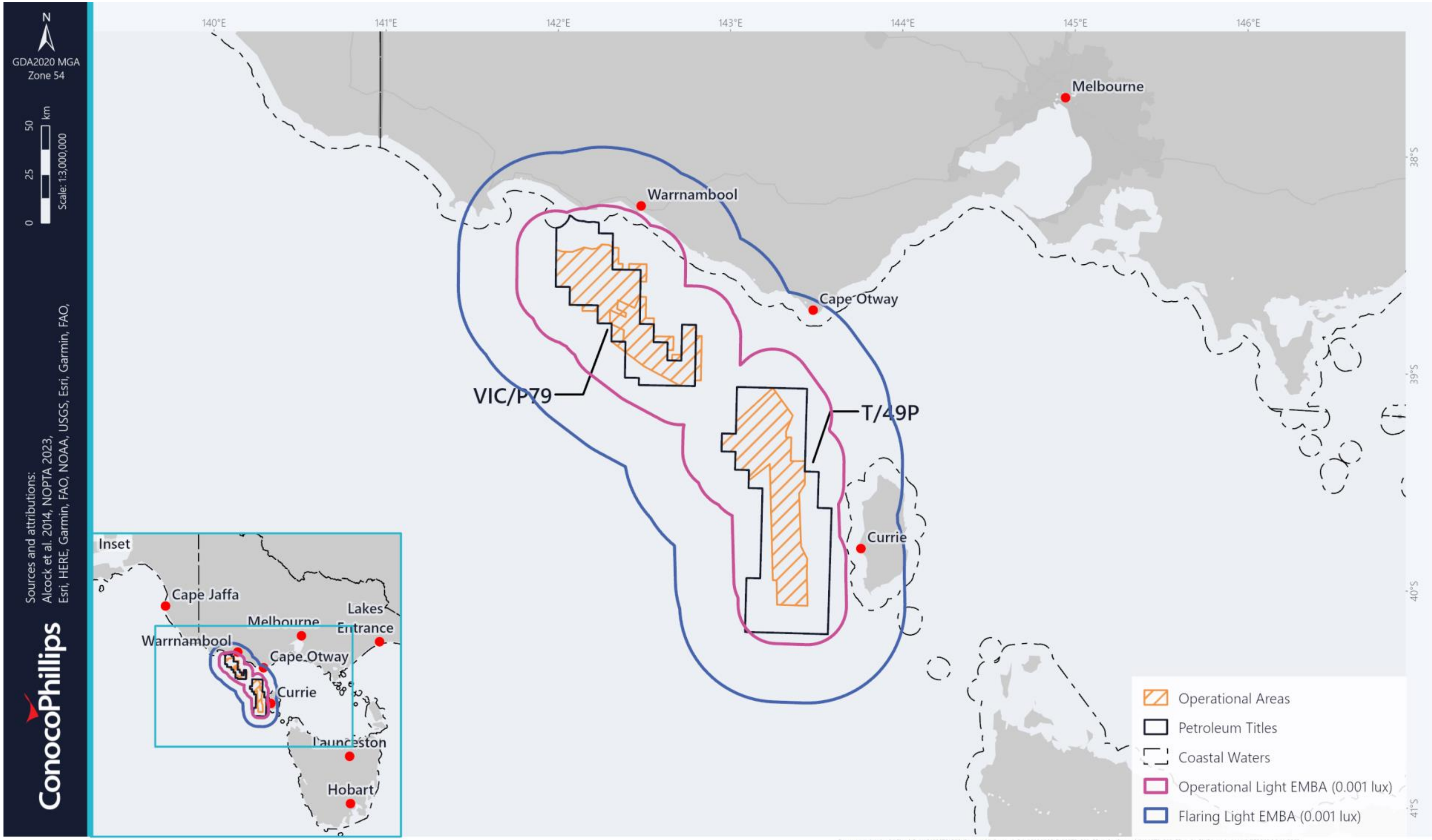


Figure 6-20: Routine and flaring light EMBAs within permit areas VIC/P79 and T/49P

6.4.5. Consequence Evaluation

The National Light Pollution Guideline for Wildlife identifies marine turtles, seabirds and migratory shorebirds as species that are susceptible to artificial light and are considered as the only species that can potentially be impacted to a significant enough level to require assessment (CoA 2023).

The guidelines aim to ensure that artificial light is managed so wildlife is:

- Not disrupted within, nor displaced from, important habitat, and
- Able to undertake critical behaviours such as foraging, reproduction and dispersal.

The guidelines recommend undertaking a light impact assessment where important habitat for listed species sensitive to light are located within 20 km of the light source. However, as the flaring EMBA extends to 50 km from the point source, a conservative approach has been taken with species within the flaring EMBA evaluated. Evaluation includes the assessment of important habitats and areas necessary for an ecologically significant proportion of a listed species to undertake important activities such as foraging, breeding or roosting.

For the purposes of this EP, only species listed as Threatened under the EPBC Act that are likely to occur in the light EMBAs were considered to have conservation significance warranting further discussion in this section. Likely occurrence was determined by the PMST report or through designation of a BIA (e.g. breeding, roosting, foraging, and migrating). Additionally, species identified during consultation, such as the hooded plover, have been considered.

The consequence of impacts to marine protected areas and coastal communities has also been assessed on the basis of potential worst-case scenarios (i.e., assuming drilling activities occur at locations within the operational areas that are closest to relevant coastlines, communities and marine parks).

6.4.5.1. Ecological Receptors

Seabirds and Shorebirds

The physical aspects of light that have the greatest impact on seabirds include intensity and colour (wavelength). Seabirds and shorebirds perceive light slightly differently. In general, all seabirds are sensitive to violet – blue wavelengths (Capuska et al. 2011), long wavelengths when using their photopic vision (daylight adapted), and short wavelengths when using scotopic vision (dark adapted) (CoA 2023). Most seabirds will be more attracted to very bright, high intensity lights, regardless of the colour (Raine et al. 2007). Numerous, albeit often conflicting, reports exist on the attractiveness of wavelengths for seabirds. There is however a consensus that white light has the greatest effect as it contains all wavelengths of light (Rich and Longcore 2006).

Seabirds may be attracted to the light glow from the MODU and support vessels. Bright lighting can disorientate birds, thereby increasing the likelihood of seabird injury or mortality through collision with the vessel, or mortality from starvation due to disrupted migration or foraging at sea (Wiese et al. 2001). Disorientation may also result in entrapment, stranding, grounding, and interference with navigation (CoA 2023). Whilst all bird species are vulnerable to the effects of lighting, seabirds active at night while migrating, foraging, or returning to colonies are most at risk (CoA 2023). The National Light Pollution Guidelines for Wildlife also noted that artificial light may provide enhanced capability for seabirds to forage at night. However, this more likely associated with coastal areas. Whilst the flaring EMBA will overlap a limited amount of coastline, the increased light level will be minimal (<0.007 Lux) and for a short duration (120 hours).

In general, young birds (fledglings) are more likely to become disorientated by artificial light sources as they are more vulnerable to the effects than adults. Fledglings have been observed being affected by lights up to 15 km away, with counts of fledgling mortalities from grounding shown to be largely underreported (Rodriguez et al. 2014). Artificial lights are thought to override the natural cues from the moon and star light on the horizon, which has the potential to attract fledging seabirds back onshore after reaching the sea (Warham

1996), or to prevent fledging's from imprinting the location of their natal colony prior to migration (CoA 2023). Furthermore, fledglings may not undertake their first flight if their nesting habitat never becomes dark (CoA 2023). The impacts of artificial light upon the viability of breeding seabird populations are largely unknown (Griesemer and Holmes 2011).

The Wildlife Conservation Plan for Seabirds (DCCEEW 2020) lists light pollution as a threat with minor consequence (individuals affected but no population level impacts expected). For most species, the threat of light pollution relates to disturbance to critical behaviours (such as nesting or roosting) on land.

Albatrosses and Petrels

The PMST Report (Appendix B) identified 14 species of albatross and 7 petrel species which have a presence or have BIAs within the both the routine light and/or flaring light EMBAs (see Figure 6-21 to Figure 6-22). Whilst the National Recovery Plan for Albatrosses and Petrels (2022) (DCCEEW 2022e) identifies light emissions as a threat, it classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction.

Seven albatross species were identified with foraging BIAs within both of the light EMBAs. All species are migratory with widespread distributions throughout the Southern hemisphere and have been shown to travel large distances when foraging. For example, the wandering albatross (*Diomedea exulans*) has been shown to cover distance between 3,600 and 15,000 km in a single foraging trip during incubation periods during the breeding season which commences early November on subantarctic islands (Jouventin and Weimerskirch 1990) (see Figure 6-22). The recognised foraging BIAs for albatross species generally covers large areas. For example, the entire South-east Marine region is recognised as a foraging BIA for the Indian yellow-nosed (*Thalassarche carteri*), Campbell (*Thalassarche impavida*) and the black-browed albatross species (Figure 6-21).

One species of albatross, listed as Endangered, has a foraging BIA overlapped by both of the light EMBAs (the shy albatross (*Thalassarche cauta*) (Figure 6-22). The shy albatross is the only albatross species endemic to Australia, with a wide distribution across the southern oceans (OEH 2022). Adult shy albatrosses predominantly occur in waters adjacent to Tasmania and southern Australia (Abbott et al. 2006b) with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of 0.7% of their likely foraging areas (Figure 6-22). Light emissions are not listed as a threat to the shy albatross within the Conservation Advice for the species (DAWE 2022b)

The remaining albatross species with foraging BIAs overlapped by both of the light EMBAs are Vulnerable and, including the antipodean (*Diomedea antipodensis*), and the Buller's albatross (*Thalassarche bulleri platei*). The antipodean albatross forages widely in the open water within the south-west Pacific Ocean, the Southern Ocean and the Tasman Sea (DoE 2022). The light EMBAs overlaps the foraging BIAs, with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of 0.22% of the foraging BIAs (see Figure 6-22). Non-breeding males were shown to have the largest range, foraging off the coast of Chile, Antarctica and in the tropical South Pacific. The Buller's albatross is a non-breeding visitor to Australia, predominantly foraging within the Pacific Ocean and the Tasman Sea, although foraging distribution on this species is poorly known (DoE 2022). The light EMBAs overlap the foraging BIAs, with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of 1.15% of the foraging BIAs (see Figure 6-21).

A further seven species of albatross have been identified within the PMST Report (Table 4-10) which do not have foraging or breeding BIAs that overlap either of the light EMBAs. Two are listed as Endangered (grey-headed albatross (*Thalassarche chrysostoma*) and northern royal albatross (*Diomedea sanfordi*)) and five as Vulnerable. Whilst the grey-headed albatross has a circum-global distribution in the Southern Hemisphere, it breeds on subantarctic island colonies from September to late May (DoE 2022) and forages primarily away from the continental shelf (Prince et al. 1998). The northern royal albatross feeds regularly in Tasmanian and South Australian waters (Garnett & Crowley 2000), however individuals are also known to disperse to the south-west Atlantic off Argentina, the eastern south Pacific near Chile, the southern Indian Ocean, and south-east Australia (DEWHA 2009).

Petrel species have a widespread distribution throughout the Southern hemisphere, with wide, recognised foraging areas. Two migratory petrel species the white-faced storm-petrel (*Pelagodroma marina*) and the common diving-petrel (*Pelecanoides urinatrix*) have foraging BIAs that overlap the light EMBAs. The white-faced storm petrels are widely distributed throughout Australia, with the Australian population estimated to be about 25 % of the global population (DSEWPaC 2011a). The light EMBAs overlap the foraging BIA, with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of 0.59% of the foraging BIAs (see Figure 6-23). The species is migratory, moving from their temperate breeding grounds to tropical and subtropical locations in late March (Underwood and Bunce 2004). There is limited information on whether the species forages at night, however, other species within the family of Procellariidae, such as the white-bellied storm-petrel (*Fregetta grallaria grallaria*), have been identified to forage both day and night (DoE 2022; Hutton 1991).

The common-diving petrel is the only species with a foraging BIA to overlap both of the light EMBAs which is confirmed to forage at night, occasionally identified to forage on vertically migrating plankton (Brooke 2004) (see Section 6.4.5.1). The species typically forages in the near-shore areas around their breeding colonies before migrating to tropical locations in January (Brooke 2004; del Hoyo et al. 1992). The common diving petrel's foraging BIA is overlapped by the light EMBAs with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of 1.8% of the foraging BIA (see Figure 6-23). In general, they undertake a unimodal foraging trip duration strategy (consistent short daily foraging trips) during both incubation and chick-rearing periods, unlike other small seabirds within their family (Fromant et al. 2021). However, studies on common-diving petrels within the Bass Strait have shown higher foraging efforts compared to other populations (with foraging trips averaging 71 ± 3 km), potentially due to the sparse distribution of prey (mostly coastal krill) (Formant et al. 2021). There is potential for light emissions from the activity to overlap with the occasional foraging times of the common diving petrel. A breeding BIA was identified within the light and flaring EMBAs in VIC/P79 in the northern extent, with the largest light footprint (50 km around the drilling area during flaring) overlapping Lady Julia Percy Island (see Figure 6-23). The breeding season for this species is variable; however, breeding is known in southern Australia, specifically on 53 islands offshore Tasmania (DCCEEW 2020). They are particularly susceptible to coastal light impacts when returning to or leaving the nesting colony which may result in a disruption to adult nest attendance (CoA 2023). Additionally, fledglings are also susceptible to the impacts of light emissions as it makes them more vulnerable to predation during activities occurring at night (CoA 2023). There is limited potential for routine lighting to affect the breeding BIA, given the closest distance to Lady Julia Percy Island from the operational areas is approximately 17 km. There is potential for light emissions associated with flaring to increase light levels at the breeding BIA which may occur during varying breeding times. However, this would be restricted to no more than 120 hours per well. There is currently no recovery plan or conservation advice available for this species.

A further six petrel species were identified within the PMST Report but do not have BIAs that overlap either of the light EMBAs. Two are listed as Endangered (southern giant-petrel (*Macronectes giganteus*) and Gould's petrel (*Pterodroma leucoptera*)).

The majority of albatross and petrel species are known to forage during the day and are less active at night due to the reduced ability to see and capture prey (Phalan et al. 2007). Therefore, foraging activity is unlikely to be affected due to a change in ambient light. Albatross and giant petrel species have a wide distribution in southern Australian waters where they exhibit a broad range of foraging behaviours and diverse diets. Therefore, a localised change in ambient light as a result of Otway Exploration Drilling Program operations is unlikely to affect foraging behaviours. A change in ambient light is also unlikely to cause behavioural changes or result in injury/mortality to albatrosses or petrel species.

Shearwaters

The light EMBA PMST Report (Appendix B) identified two species of shearwaters which have BIAs within the light EMBAs (short-tailed shearwater (*Ardenna tenuirostris*) and wedge-tailed shearwater (*Ardenna pacifica*)) neither of which have a threatened status listing.

During consultation, feedback regarding the impact of light emissions on the short-tailed shearwater was raised, along with concerns for the protection of their food sources in their breeding grounds (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346).

Short-tailed shearwaters are known to alternate short foraging trips with long foraging trips within Australian waters during the breeding season (Berlincourt & Arnould 2015). Some long foraging trips can take up to 17 days, with individuals travelling large distances to the Polar Frontal Zone to forage (Weimerskirch and Cherel 1998). When present in Australian waters (September to May) the species are known to typically forage during daylight, returning to the colonies after feeding (AAD 2020). The foraging BIA for the short-tailed shearwater is overlapped by the T/49P and VIC/P79 (southern extent) light EMBA and the flaring EMBA in each operational area, with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of 2.7% of the foraging BIAs (Figure 6-23). This species has multiple breeding sites recognised on numerous islands off Victoria and Tasmania during the breeding season (Baker and Hamilton 2013). The closest identified breeding BIA for the short-tailed shearwater is located approximately 28 km from the operational area (see Figure 6-23) and is outside of the routine light EMBA, but overlapped by the flaring EMBA. However, other locations where short-tailed shearwaters may breed, such as Deen Maar and Middle and Griffiths islands, are 17 km and 20 km respectively from the VIC/P79 operational area. These are not identified as BIAs, likely due to a lower number of breeding pairs in comparison to other offshore islands. As flaring will only be intermittent and temporary (120 hours per well) these emissions are not expected to cause behavioural impacts or injury/mortality to the species. There is no recovery plan or conservation advice available for this species and light has not been identified as a threat. [Paragraph updated in response to Matter: B05].

The wedge-tailed shearwater is listed as a marine and migratory species. The foraging BIA of the species was overlapped by both the routine light and flaring EMBAs, with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of 1.2% of the foraging BIAs (see Figure 6-23). The species have been recorded to predominantly forage during the day and form large aggregations referred to as “rafts” just offshore from their breeding colony just on dusk and enter and leave the colony at night to avoid predators (Warham 1996). A breeding BIA is also overlapped by the flaring EMBA in VIC/P79 (Figure 6-23). This species breeds colonially in summer throughout its known range, typically on vegetated islands (DoE 2020g). Flaring impacts will only be intermittent and temporary (120 hours per well), and therefore are not expected to cause impact at a population level. A change in ambient light within the EMBAs is unlikely to cause behavioural changes or result in injury/mortality to the wedge-tailed shearwater. No recovery plan or conservation advice exists for the species, and light has not been identified as a threat to the wedge-tailed shearwater (DoE 2020).

The vulnerable Sooty Shearwater may occur within the light and flaring EMBAs; however, this species does not have foraging or breeding BIAs that overlap the light EMBAs and light is not listed as a threat in the Conservation Advice for this species. An additional species of shearwater was identified within the PMST Report (Appendix B), however it presents no known BIAs that overlap the light EMBAs. Shearwater species have a wide distribution in southern Australia and a localised change in ambient light within the EMBAs is unlikely to affect foraging behaviours or cause injury/mortality. [Paragraph updated in response to Matter B19].

During public comment, ConocoPhillips Australia was advised that shearwater fledglings are particularly susceptible to disorientation due to artificial lighting and can be affected by lights up to 15 km away, or at light level at 0.18 Lux. (Chevillion et al 2022, Rodríguez et al. 2015, National Light Pollution Guidelines for Wildlife (CoA 2020), Rodríguez 2014). The increase in ambient light related to flaring at 17 km distance has been calculated at <0.009 Lux. This increase is significantly lower than that used for assessment in the National Light Pollution Guidelines for Wildlife (2020) and detailed in Rodríguez et al. 2015. In addition, shearwaters usually undertake the activity of “fledging” only in the first two hours after sunset (Gineste 2016 cited in Chevillion et al. 2022), therefore the period in which fledglings are at risk of being affected per day is limited. [Paragraph added in response to Matter: B05, B10].

Eastern Curlew

The Critically Endangered eastern curlew (*Numenius madagascariensis*) has been identified within the EPBC PMST Report for the light EMBAs (Appendix B). The species undertakes long annual migratory flights to breeding sites in Russia and north-eastern China and returns to Australian waters in August (DoE 2022). The eastern curlew has widespread distribution in coastal regions within the north-east and south of Australia, including Tasmania (Birdlife 2022b). Within Australia, the eastern curlew is known to inhabit intertidal coastal habitats, such as mudflats, estuaries, and sheltered coasts and bays (Birdlife 2022b).

During consultation, feedback regarding the impact of light emissions on the migration of the eastern curlew was raised, with increased activity and light pollution having the potential to impact on this already critically endangered species. (Org ID: 569, Tasmanian Climate Collective, Event ID 3469, FB ID: 435).

No BIAs or habitat critical to the survival of the species were identified within the light EMBAs. Given its habitat preferences, this species is unlikely to occur within the light EMBAs other than potentially overflying during migration, with the northern migration to breeding sites starting in late February and March-April, and the southern migration to Australian waters occurring during August and September (Marchant and Higgins 1993). A change in ambient light within the EMBAs is unlikely to cause behavioural changes or result injury/mortality to the eastern curlew.

Curlew Sandpiper

The Critically Endangered curlew sandpiper (*Calidris ferruginea*) has been identified within the EPBC PMST Report for the light EMBAs (Appendix B). The curlew sandpiper has a widespread distribution throughout Australia, with records confirming the species presence in all states and territory, including King Island. Population numbers have demonstrated numerous declines globally, with south-east Tasmania numbers decreasing by 100% between 1973 – 2014 (Woehler pers. Comm. (2014) in DoE 2022). A large portion of this global decline is attributed to the ongoing loss of mudflats within the Yellow Sea, a key migration staging site, and local coastal development and activities causing disturbance (DoE 2022). The species mainly occurs in intertidal mudflats within sheltered coastal areas where they forage on invertebrates, and less often inland, near lakes, dams, and waterholes (DoE 2022). No BIAs or habitat critical to the survival of the species were identified within the light or flaring EMBAs. Given its habitat preferences, this species is unlikely to occur within the light EMBAs other than overflying during migration, arriving in south-eastern Australia in late August, and starting the migration North again in March (DoE 2022). A change in ambient light within the EMBAs is unlikely to cause behavioural changes or result injury/mortality to the curlew sandpiper.

Australasian Gannet

A foraging BIA for the Australasian gannet (*Morus serrator*) was identified within the light EMBA of the northern extent of VIC/P79 and the flaring EMBA of all operational areas. The largest light EMBA (50 km around the drilling area during short-term flaring) overlaps 17.1% of the foraging BIA (see Figure 6-24). Further, two aggregation BIAs for the species were also identified within the flaring EMBA in VIC/P79 (northern extent) overlapping the Lawrence Rocks and Point Danger location near Portland (Figure 6-24). This seabird species is confined to the waters around Australian and New Zealand, typically in the temperate zone (DCCEEW 2020). Breeding occurs seasonally between October and May off the coast of Victoria, Tasmania and New Zealand (DCCEEW 2020). Flaring impacts will only be intermittent and temporary (120 hours per well), and therefore not expected to cause impact at a population level. A change in ambient light within the EMBAs is unlikely to cause behavioural changes or result in injury/mortality to the Australasian gannet. No recovery plan or conservation advice exists for the species, and light has not been identified as a threat to the Australasian gannet (DoE 2022).

Black-faced Cormorant

The foraging BIA for the black faced cormorant (*Phalacrocorax fuscescens*) was identified within the light and flaring EMBAs in T/49P, with the largest light footprint (50 km around the drilling area during short-term flaring) overlapping a maximum of 0.5% of the total foraging BIA (see Figure 6-24). The species is endemic to Southern Australia and is associated with a wide foraging range, from coastal waters, sheltered bays, islets, to coastline rivers along the coasts of Tasmania and Victoria (DoE 2015a). The species are known to breed on rocky islands (del Hoyo et al. 1992) with the closest breeding location located approximately 30 km from the operational area (Figure 6-24). Breeding can occur throughout the year for the black-faced cormorant within Australia (Birdlife 2022d); however, studies on colonies within south-eastern Australia have reported peak breeding to occur in late winter (July), suggested as a strategy to avoid the high ambient temperatures associated in the region during summer (Taylor et al. 2013). The breeding BIA for this species overlaps with the flaring EMBA. Flaring impacts will only be intermittent and temporary (120 hours per well), and therefore not expected to cause impact at a population level. A change in ambient light within the EMBAs is unlikely to cause behavioural changes or result in injury/mortality to the black-faced cormorant.

Little Penguin

A foraging and breeding BIA for the little penguin (*Eudyptula minor*) was identified within the flaring EMBA of T/49P (Figure 6-24). Despite the colony of little penguins at Manly, Sydney Harbour, being protected as an endangered population, the Australian population is considered stable at approximately one million birds (Birdlife 2022c). The species is known to exhibit a wide foraging range, with individuals able to spend weeks away at sea foraging (McCutcheon et al. 2011). The closest breeding aggregation areas exist at Christmas Island located of off nearby King Island approximately 30 km from the T/49P operational area (see Figure 6-24) and at Lady Julia Percy Island and Middle Island located approximately 17 and 20 km from VIC/P79, respectively. Breeding typically occurs from September to February. Studies suggest that penguins were habituated to artificial lights and were unaffected by a 15 lux increase in artificial illumination (Rodriguez et al. 2016). The breeding BIA for the species only overlaps with the flaring EMBA. The increase in light level intersecting the coastline at Christmas Island has been estimated as being approximately <0.003 lux, and <0.005 to <0.007 lux at Warrnambool and Port Fairy near Middle Island and Lady Julia Percy Island (Appendix F). In addition, a change in ambient light levels from flaring operations will only be intermittent and temporary (120 hours per well), and not expected to cause impact at a population level. Therefore, a change in ambient light within the EMBAs is unlikely to cause behavioural changes or result in injury/mortality to the little penguin.

Great Knot

The Vulnerable great knot (*Calidris tenuirostris*) has been identified within the EPBC PMST Report (Appendix B). This species breeds in the northern hemisphere and undertakes biannual migrations along the East Asian-Australasian Flyway where majority of the population will winter along the northern coast of Australia (DCCEEW 2024d). Although it has been recorded around the entirety of the Australian coastline the great knot is much less common along the southern Australian coastline (DCCEEW 2024d). This species is expected to be present within Australia between August and March where it can be found in sheltered coastal habitats with large intertidal mudflats (DCCEEW 2024d). No BIAs or habitat critical to the survival of the species were identified within the light EMBAs. Given its habitat preferences, this species is unlikely to occur within the light EMBAs. Therefore, a change in ambient light is unlikely to cause behavioural changes or result in injury/mortality to the great knot.

Swift Parrot

The Critically Endangered swift parrot (*Lathamus discolor*) has been identified within the EPBC PMST Report (Appendix B). During summer, it breeds in colonies in blue gum forest of south-east Tasmania with infrequent breeding also occurring in north-west Tasmania. The entire population migrates to the mainland for winter where it disperses widely (DoE 2022).

During consultation, feedback regarding the impact of light emissions on the migration of the swift parrot was raised, with increased activity and light pollution having the potential to impact on this already critically endangered species. (Org ID: 569, Tasmanian Climate Collective, Event ID 3469, FB ID: 435).

No BIAs or habitat critical to the survival of the species were identified within the light of flaring EMBAs. Given its habitat preferences, this species is unlikely to occur within the light or flaring EMBAs other than overflying during migration. Therefore, a change in ambient light within the EMBAs is unlikely to cause behavioural changes or result in injury/mortality to the swift parrot.

King Island Scrubtit

The Critically Endangered King Island scrubtit (*Acanthornis magna greeniana*) has been identified within the EPBC PMST Report (Appendix B). This species has limited distribution on King Island and tends to be restricted to areas of mature swamp paperbark forest that occur in flat, low lying and poorly drained swamps (DoE 2022). No BIAs or habitat critical to the survival of the species were identified within the light EMBAs. Given its habitat preferences, this species is unlikely to occur within the light EMBAs. Therefore, a change in ambient light is unlikely to cause behavioural changes or result in injury/mortality to the King Island scrubtit.

Regent Honeyeater

The Critically Endangered regent honeyeater (*Anthochaera phrygia*) has been identified within the EPBC PMST Report (Appendix B). This species typically inhabits the inland slopes of the Great Dividing Range and is commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest; however, it sometimes utilises lowland coastal forest (DoE 2015f). The species movement patterns are thought to be dictated by the flowering of specific eucalypt species as their diets are primarily made up of nectar. No BIAs or habitat critical to the survival of the species were identified within the light EMBAs. Given its habitat preferences, this species is unlikely to occur within the light EMBAs. Therefore, a change in ambient light is unlikely to cause behavioural changes or result in injury/mortality to the regent honeyeater.

Plains-wanderer

The Critically Endangered plains-wanderer (*Pedionomus torquatus)* has been identified within the EPBC PMST Report (Appendix B). This sedentary species typically inhabits sparse grasslands and are capable of breeding within their first year (DoE 2015g). No BIAs or habitat critical to the survival of the species were identified within the light EMBAs. Given its habitat preferences, this species is unlikely to occur within the light EMBAs. Therefore, a change in ambient light is unlikely to cause behavioural changes or result in injury/mortality to the plains-wanderer.

Orange-bellied Parrot

The likely distribution and probable migration route identified for the Critically Endangered orange-bellied parrot (*Neophema chrysogaster*) overlap the light and flaring EMBA boundaries, with the largest light footprint (50 km around the drilling area during flaring) overlapping a maximum of the likely distribution by 5.6% and the probable migration route by a maximum of 6.7% (Figure 6-25). No BIAs or areas deemed as habitat critical to the survival of the species were identified within the light or flaring EMBAs.

The orange-bellied parrot is a ground feeding parrot which breeds in south-west Tasmanian. They migrate from Tasmania to Victoria between late February and early April (Australian Museum 2022b). In Victoria, the orange-bellied parrot mostly occurs in sheltered coastal habitats, such as bays, lagoons and estuaries, or, rarely, saltworks. The parrot's breeding habitat is restricted to south-west Tasmania, where breeding occurs from November to mid-January mainly within 30 km of the coast (Brown and Wilson, 1980). During winter, on mainland Australia, orange-bellied parrots are found mostly within 3 km of the coast (DELWP 2016).

The 2023-24 breeding season showed a record number of 81 orange-bellied parrots return to breeding grounds and production of 59 fledglings, the third highest fledgling production since 2004 (NRE Tasmania

2024). It is estimated that a total of 139 individuals would have migrated north from the breeding grounds at the end of the 2022/23 breeding season of which 81 returned for the 2023/24 breeding season resulting in a 58% return rate (DPC 2023).

Figure 6-25 displays the orange-bellied parrot presence and migration routes as detailed in the Species of National Environmental Significance Distributions (public grids) (DAWE 2021) and the National Recovery Plan for the Orange-bellied Parrot *Neophema chrysogaster* (DELWP 2016).

During consultation, feedback regarding the impact of light emissions on the migration of the orange-bellied parrot was raised, with increased activity and light pollution having the potential to impact on this already critically endangered species (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID; 378; Org ID: 569, Tasmanian Climate Collective, Event ID 3469, FB ID: 435; Org ID: 553, Australian Parents For Climate Action (North Tas and Surf Coast), Event ID: 3257, FB ID: 342).

This species is expected to occur within the flaring EMBA within its non-breeding range along the coast, and within the light and flaring EMBAs during migrations (Figure 6-25). The National Recovery Plan for the Orange-bellied Parrot (DELWP 2016) identifies that the behaviour of this species may be modified by the presence of barriers such illuminated structure and boats, with the impacts of barriers greatest where they occur on migration routes, though there is little more than anecdotal evidence to support this. The operational areas do not overlap the migration route of the orange-bellied parrot and, as such, the activities of the MODU and vessels when undertaking the petroleum activity do not present the same risk as that associated with illuminated structures or illuminated boats within the migration route. Impacts associated with flaring, which will not occur within the migration route but rather may change ambient light in the area, will be temporary and of short duration (120 hours per well). Therefore, a change in ambient light is unlikely to cause behavioural changes or result in injury/mortality to the orange-bellied parrot. Changes in ambient light in the non-breeding range associated with short-term flaring (less than 120 hours per well) at the closest possible distance of 19 km from the Victorian coast are predicted to result in an increase in light intensity of <0.007 lux (Table 6-12), which is less than the light from a quarter moon night sky (0.01 lux). Consequently, a change in ambient light is not predicted to cause behavioural changes or result in injury/mortality to the orange-bellied parrot while on migration or within the non-breeding range.

Hooded Plover

The Vulnerable hooded plover (eastern) (*Thinornis rubricollis rubricollis*) has been identified within the EPBC PMST Report (Appendix B). It was also identified as a species of value during consultation (Org ID: 5, Colac Otway Shire Council, Event ID: 582, Document ID: 1483). The hooded plover (eastern) inhabits ocean beaches, particularly wide beaches backed by dunes with large amounts of seaweed, creek mouths and inlet entrances. It may also occur on near-coastal saline and freshwater lakes and lagoons, tidal bays and estuaries, on rock platforms, or on rocky or sandy reefs close to shore (Marchant & Higgins, 1993; Garnett et al., 2011). No BIAs or habitat critical to the survival of the species were identified within the light EMBAs. Whilst the hooded plover may occur within the VIC/P79 light EMBA and all flaring EMBAs, light is not listed as a threat to the species. Therefore, a change in ambient light is unlikely to cause behavioural changes or result in injury/mortality to the hooded plover.

The inherent consequence severity of light and flaring impacts on birds is assessed as **Minor (2)** based on:

- Lighting on survey vessels, the MODU and support vessels will be limited to that which is required for navigational and safety purposes.
- The flaring light EMBA overlaps breeding BIAs for five species (short-tailed shearwater, black-faced cormorant, common diving petrel, wedge-tailed shearwater and little penguin). The impact from flaring will be intermittent and temporary (approximately 120 hours per well) and is therefore not expected to interrupt breeding behaviours or cause impact at a population level for shearwater, black-faced cormorant or the little penguin.

- The common diving petrel was identified as the only seabird confirmed to forage at night. This nocturnal species partakes in unimodal foraging trips during breeding periods and is particularly susceptible to coastal light impacts when returning to or leaving the nesting colony which may result in a disruption to adult nest attendance (CoA 2023). Artificial light has been noted to potentially provide enhanced capability for seabirds foraging at night (CoA 2023). There is potential for flaring to increase light levels at the breeding BIA which may occur during varying breeding times. The impact from flaring will be intermittent and temporary (approximately 120 hours per well) and is therefore not expected to interrupt breeding behaviours or cause impact at a population level for this species.
- Foraging BIAs that overlap the light EMBAs ranged in size from a 0.22% overlap with the Vulnerable antipodean (*Diomedea antipodensis*) and Buller's albatrosses (*Thalassarche bulleri platei*) BIAs, to a 17.1% overlap with the Australasian gannet (*Morus serrator*) foraging BIA. The Australasian gannet is not listed as threatened under the EPBC Act, but is recognised as a conservation value in the south-east (DoE 2015b). Given the large areas typically covered by foraging individuals, and the transient nature of the species, light impacts are not expected to cause significant impacts to foraging behaviours.
- Light emissions are identified as a threat in the National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e) but classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction.
- Light pollution is listed as a threat to seabirds in the Wildlife Conservation Plan for Seabirds (DCCEEW 2020), with potential for consequences affecting individuals but not whole populations). Light emissions will be managed in a manner to not contravene the objectives of this plan.
- Light emissions will be managed in a manner to not impact on the recovery of the orange-bellied parrot as per the recovery plan (DELWP 2016):
    - Illuminated structures and illuminated boats have been identified as a potential barrier to migration and movement for the orange-bellied parrot (DELWP 2016). The operational areas do not overlap the migration route of the orange-bellied parrot and, as such, the activities of the MODU and vessels when undertaking the petroleum activity do not present the same risk as that associated with illuminated structures or illuminated boats within the migration route. This critically endangered species may migrate over the flaring light EMBA from February-April and when returning in November. Impacts associated with flaring, which will not occur within the migration route but rather may change ambient light in the area, will be temporary and of short duration (120 hours per well) and are not expected to interrupt migration behaviours or cause impact at a population level for this species.

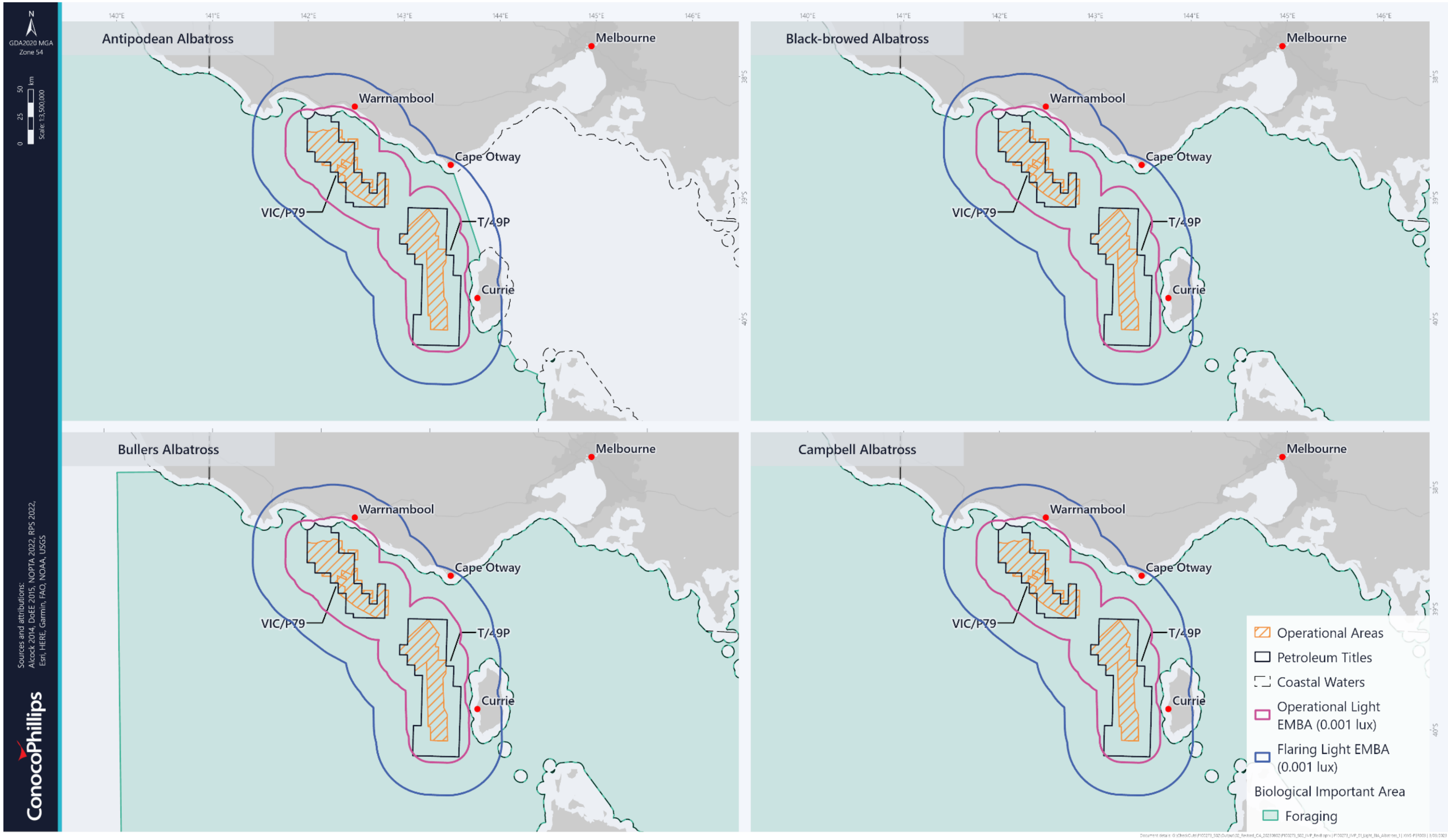


Figure 6-21: Light EMBAs and BIAs for antipodean, black-browed, Buller's and Campbell albatross

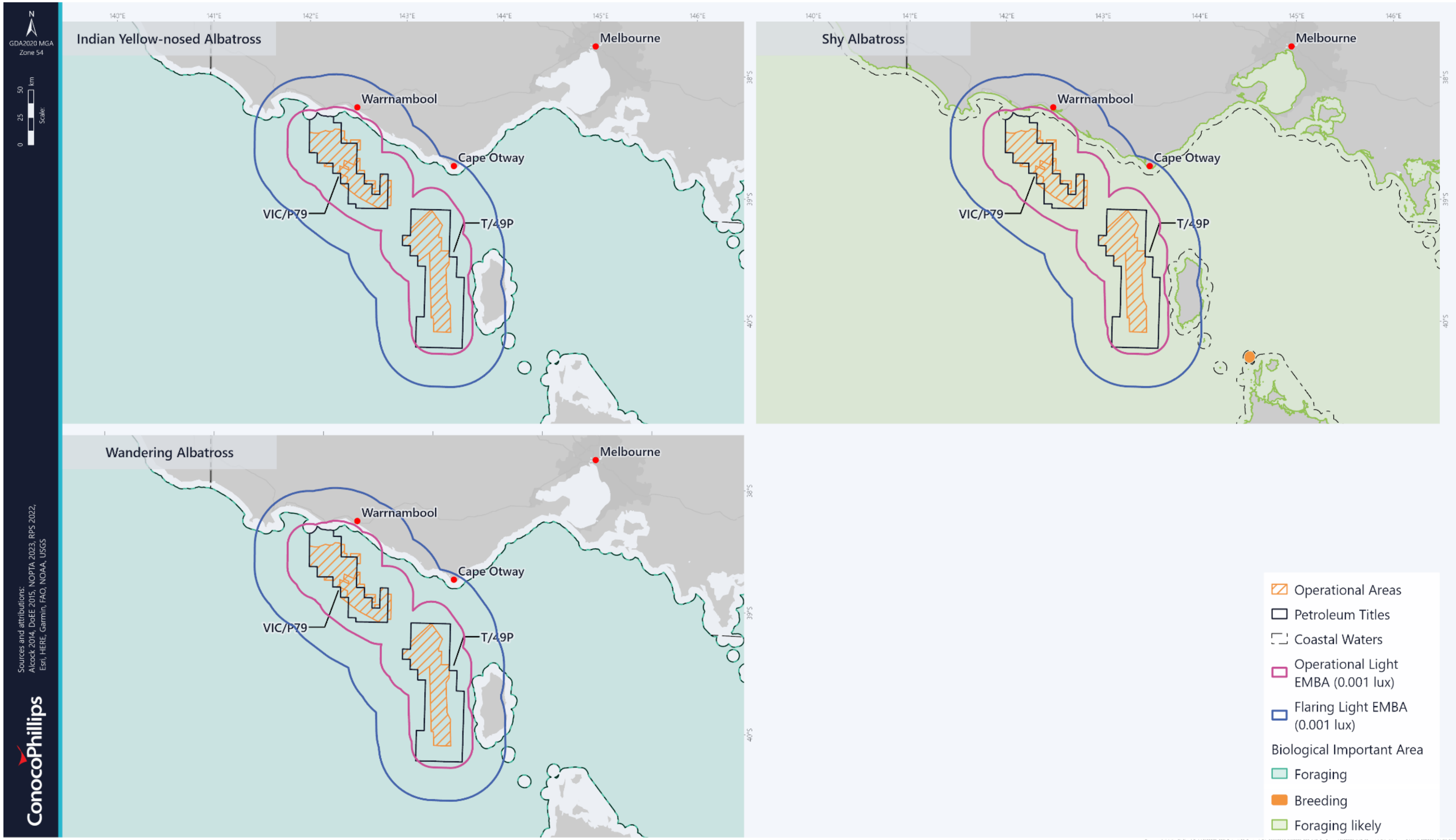


Figure 6-22: Light EMBAs and BIAs for the Indian yellow-nosed, shy and wandering albatross

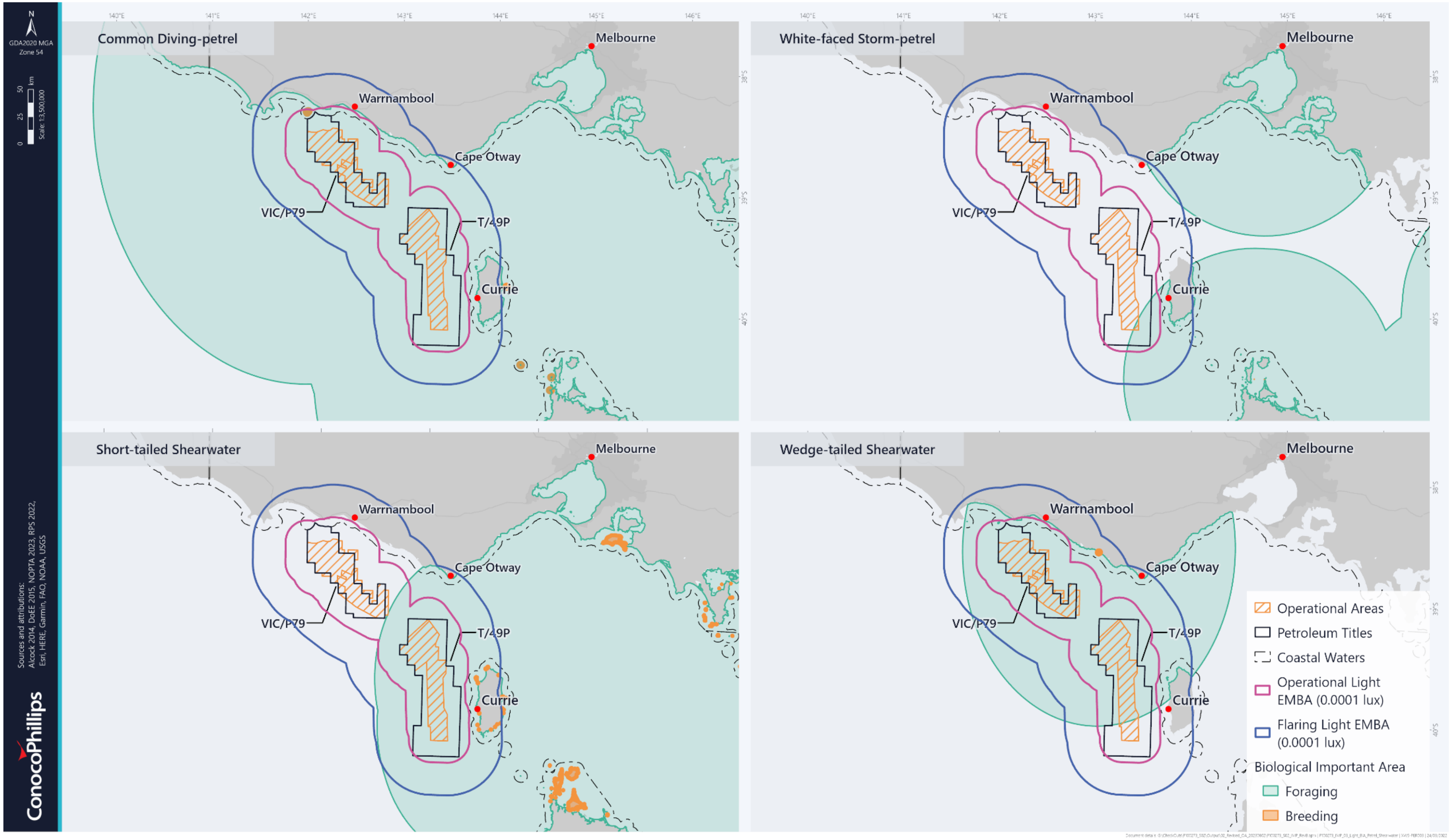


Figure 6-23: Light EMBAs and BIAs for common-diving, white-faced storm petrels and short-tailed, wedge-tailed shearwaters

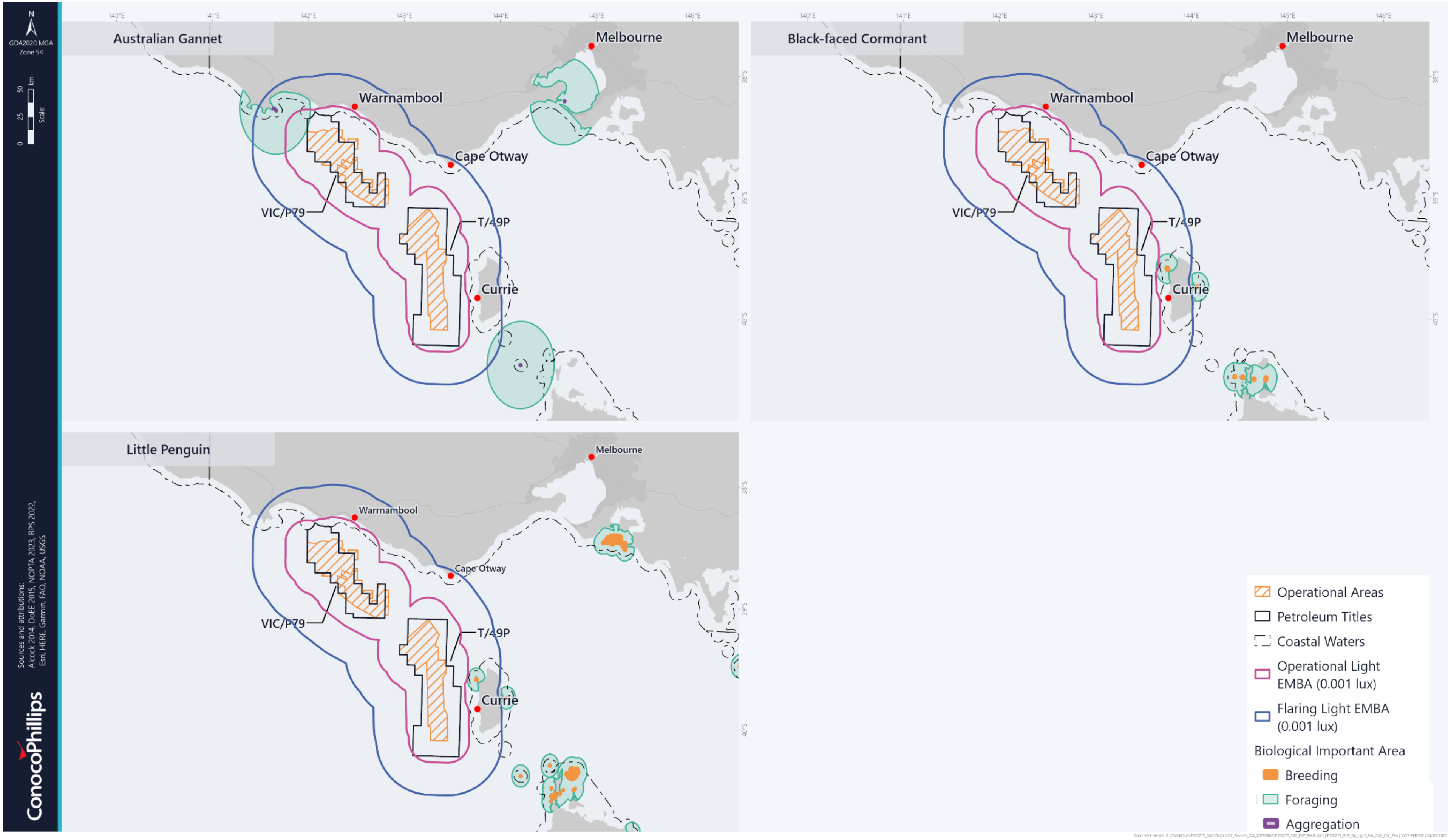


Figure 6-24: Light EMBAs and BIAs for, black-faced cormorant, Australasian gannet and little penguin

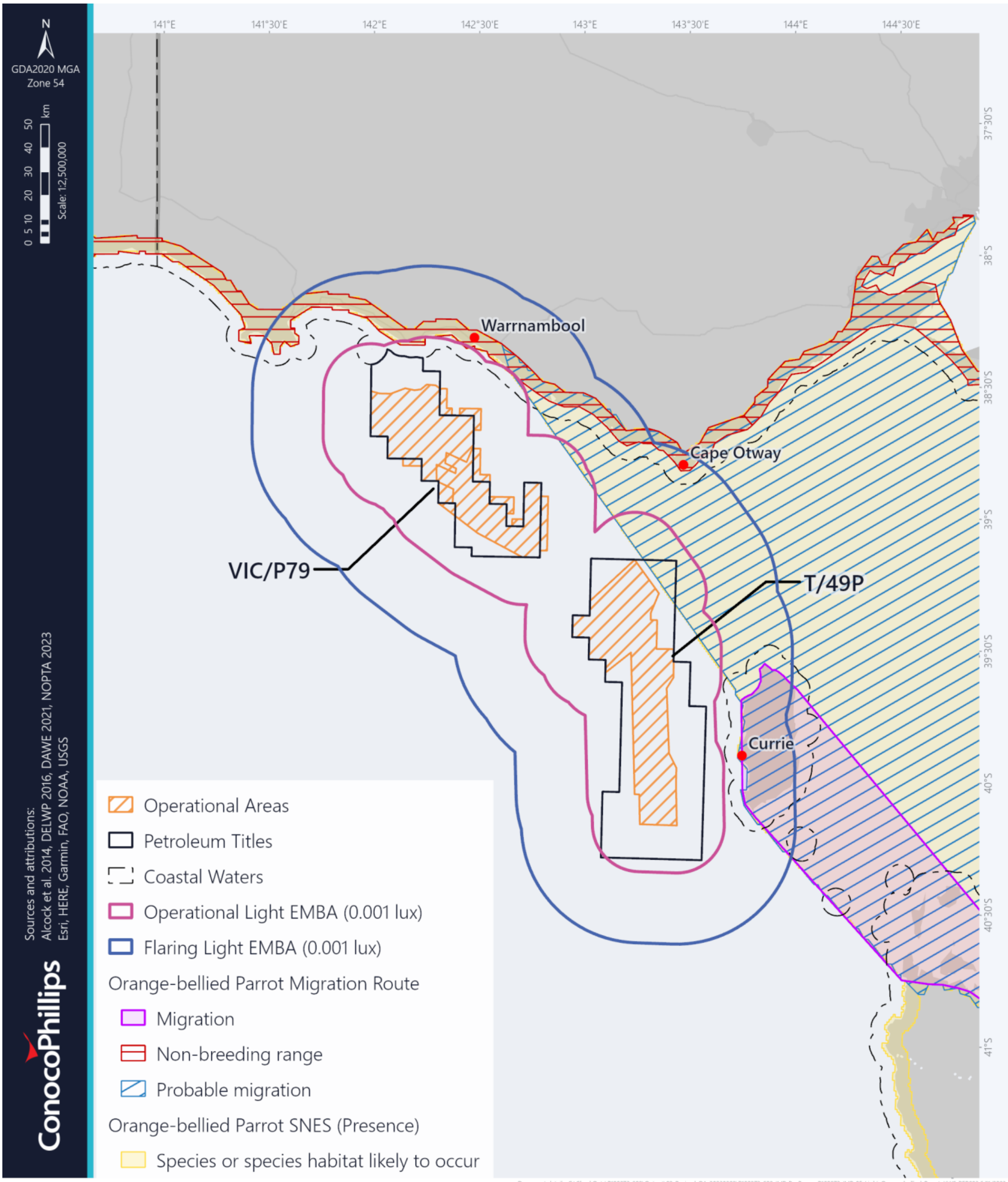


Figure 6-25:Distribution, migration routes and breeding ranges for the orange-bellied parrot within the light EMBAs

Marine Reptiles

Artificial light can disrupt turtle nesting and hatching behaviours and is listed as a key threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017). Although listed turtle species may occur within the routine light and flaring EMBAs, no biologically important behaviours, BIAs, or habitat critical to survival for marine turtles were identified (Appendix B). Consequently, population level impacts to marine turtles from routine light and flaring emissions are not predicted to occur.

The consequence severity of light and flaring impacts for marine reptiles is assessed as **Minor (2)** based on:

- Artificial light is listed as a key threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017), however,
- No biologically important behaviours, BIAs, or habitat critical to survival for marine turtles were identified within the light or flaring EMBAs.

6.4.5.2. Conservation Values and Sensitivities

The routine light and flaring light EMBAs overlaps all of the Zeehan Commonwealth Marine Reserve (Multiple Use Zone – IUCN Category VI), 3.3% of the Zeehan Commonwealth Marine Reserve (Special Purpose Zone – IUCN Category VI) and 99.2% of the Apollo Commonwealth Marine Reserve (Multiple Use Zone – IUCN Category VI).

Light pollution associated with offshore mining operations (including oil and gas operations) and other offshore activities is listed as a pressure on the conservation values of the South-east Marine Reserve Network within the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013). The estimates of increased light intensity as a result of exploration activities on the identified marine reserves is detailed in Table 6-12.

Table 6-12: Light sensitive coastal communities and marine parks within the light EMBAs and the associated light intensity

Receptor	Routine light EMBA (20 km)	Estimated Light Intensity (Lux)*	Flaring EMBA (50 km)	Estimated Light Intensity (Lux)*
Apollo AMP	✓	<0.002	✓	<0.05
Bungaree (King Island)	X	<0.001	✓	<0.002
Cape Otway (Victoria)	X	<0.001	✓	<0.002
Cape Wickham Lighthouse (King Island)	X	<0.001	✓	<0.002
Currie (King Island)	X	<0.001	✓	<0.003
Loorana (King Island)	X	<0.001	✓	<0.003
Nugara (King Island)	X	<0.001	✓	<0.003
Portland (Victoria)	X	<0.001	✓	<0.002
Port Campbell (Victoria)	X	<0.001	✓	<0.002
Port Fairy (Victoria)	✓	<0.001	✓	<0.007
Warrnambool (Victoria)	X	<0.001	✓	<0.005
Whistler Point (King Island)	X	<0.001	✓	<0.003
Zeehan AMP	✓	10	✓	10

*Assumes no line of site obstructions

As described within Section 4.4.1 the conservation values for the Apollo Marine Reserve include benthic habitats and communities, cultural and heritage sites and ecological receptors such as pinnipeds, cetaceans, seabirds (DNP 2013). The Zeehan Marine Reserve conservation values include seafloor habitats, cetaceans and seabirds (DNP 2013). Evaluation of the impacts from routine and flaring light emissions on the ecological receptors has been assessed above in Section 6.4.5.1.

The routine light and flaring EMBAs also overlap with several Threatened Ecological Communities (TECs) (refer to Section 4.4.8 and Appendix B). These TECs are listed to provide system-level conservation, specifically for listed threatened species which have already been assessed above in Section 6.4.5.1. Threatened species could be indirectly impacted by light emissions if elements of the ecosystems upon which they depend are affected, e.g., if habitat or prey species are affected. Upward vertical migration of zooplankton can be disrupted by artificial light, resulting in reduced food availability for predators of zooplankton, or over-predation of some species, leading to changes in community composition (Perkin et al. 2011). Aquatic animals in communities such as the giant kelp marine forests of southeast Australia, and subtropical and temperate coastal saltmarshes, rely on aquatic plants and other primary producers to provide food shelter, breeding sites and nurseries, and on microbial assemblages to cycle nutrients and process pollutants. (CoA 2023)

Plankton distribution is largely determined by local prevailing wind and tide driven current, and subsequently the potential for population level effects is limited due to plankton having a widespread distribution, high natural mortality rate, rapid population growth rates and anticipated mixing from both inside and outside of the impacted region (Huntley and Lopez, 1992; Richardson et al, 2017). Other aquatic fauna, such as zooplankton and fish, may be disrupted within 200 m of the source (Berg et al. 2020), with species likely to be attracted towards the light source within the impacted area (Meekan et al. 2001).

Although the extent of impact is predicted to be within 200 m of artificial light sources (based on Berg et al 2020 and Milicich et al. 1992) it has been assessed across the operational areas plus a 2 km buffer. Zooplankton, including fish eggs and larvae, present in the water column are abundant in the environment, not spatially restricted and broadly (but not evenly) distributed in the environment. Zooplankton is likely to exhibit spatial patchiness with movement with currents (Richardson et al, 2017). Consequently, population level impacts to fish, plankton and prey species from routine light and short-term flaring light are not predicted to occur (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346). Given the level of potential impact predicted, wider impacts at an ecosystem level are not expected.

The consequence severity of light impacts to conservation values and sensitivities is assessed as **Minor (2)** based on:

- The South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) lists ‘light pollution associated with offshore mining operations and other offshore activities’ as a pressure on the conservation values (DNP 2013).
- The conservation values of the Apollo and Zeehan Marine Reserves include seabirds and shorebirds which may be impacted by a change in ambient light (as assessed in Section 6.4.5.1).
- The National Light Pollution Guidelines for Wildlife (CoA 2023) considers impacts to the other values, such as pinnipeds, cetaceans and benthic communities, to not be of a level that requires assessment.
- Artificial light is not listed as a key threat in the Recovery Plan for white shark in Australia (DSEWPaC 2013a), listed as Vulnerable under the EPBC Act.
- Artificial light is not listed as a key threat in the Conservation Management Plans for the Blue Whale (DoE 2015), or the Southern Right Whale (DSEWPaC 2012b), both listed as Endangered under the EPBC Act.

- The light-producing activities associated with the exploration program will be short-term and fully recoverable.
- Ecosystem-level impacts to TECs are not expected.

6.4.5.3. Socio-economic Receptors

Coastal Communities

NOPSEMA define 'environment' to mean ecosystems and their constitute parts, including people and communities; natural and physical resources; the qualities and characteristics of locations, places and areas; the heritage value of places; and the social, economic and cultural features of all of these matters (NOPSEMA 2020b). Consequently, light and flaring associated with offshore exploration activities has been assessed to have the potential to impact on coastal communities.

Light pollution associated with offshore mining operations (including oil and gas) and other offshore activities is listed as a pressure on the conservation values of the South-east Marine Reserve Network within the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013). However, the management plan does not list tourism as being impacted.

Light emissions as a result from routine operations are expected to have a **Negligible (1)** impact on coastal communities and will be indistinguishable from other marine traffic within the area. Modelling results of lights emissions (Appendix F) predict an increase in light levels of a maximum of <0.001 Lux on the closest coastal community of Port Fairy in Victoria and Currie in Tasmania. For comparison 0.01 Lux is the equivalent of a quarter moon on a clear night and 0.001 Lux is the equivalent of a moonless night sky. Given the maximum predicted duration for drilling at each location is 90 days, the low levels of ambient light changes from the routine light will be short-term and fully recoverable.

There are several coastal communities and areas conducive to tourism located on King Island and the Victorian coast which are within the Flaring EMBA. These are detailed in Table 6-12 along with estimates of increased light intensity as a result of exploration activities. These are detailed in Table 6-12 along with estimates of increased light intensity as a result of exploration activities. Light emissions as a result of short-term flaring (up to 120 hours per well) are expected to have a **Minor (2)** impact on coastal communities. Modelling results of the light emission from flaring (Appendix F) predict an increase in light levels of <0.007 lux at the closest community of Port Fairy which is less than the light from a quarter moon night sky (0.01 lux). In addition, flaring operations will be limited to 120 hours, over multiple short-term events, per well.

Potential aesthetic impact to coastal communities, including relative Lux levels, associated with the visibility of the offshore activities has been included in Appendix F.

Fisheries

During consultation, feedback was provided that navigational and deck lighting will impact local squid fisheries by attracting squid species out of adjacent fishing areas resulting in a loss of catch (Org ID: 471, Richey Fishing Co Pty Ltd, Event ID: 536, FB ID: 11). Phototactic behaviour (the attraction to artificial light) has been observed both in fish and squids with some species known to have a positive phototaxis by moving towards and aggregating in the illuminated zone of artificial lights (Ibrahim and Hajisamae 1999). Hence fishing with artificial lights (surface light) is one of the most advanced and successful methods to increase the catch rate of squid and pelagic fish (Nguyen and Winger 2019). Whilst research into light levels that may attract squid species is limited, Ibrahim and Hajisamae (1999) found optimal levels to attract big fin reef squid (*Sepioteuthis lessoniana*) varied between 1.5 and 25 Lux and the mitre squid (*Loligo chinensis*) between 1.5 and 22.5 Lux. In Nguyen and Winger (2019) Japanese squid (*Todarodes pacificus*) are shown to have a preferred range of approximately 10 Lux but were also shown to aggregate to levels as low as 0.0034 Lux. Modelling (Appendix F) has shown that light emissions from routine operations will reach intensity levels of 1.5 Lux (the lowest optimal levels as previously described) within 300 m of the light source. Therefore, the range to which squid species are likely to be attracted to the artificial light will be within the immediate vicinity of the MODU and support vessels. In addition, drilling activities will be of a short duration (90 days per well), and therefore no long-term effects on local squid fisheries are expected.

The consequence severity of light and flaring impacts for socio-economic receptors is assessed as **Negligible (1)** based on:

- The light intensity that may affect the visual aesthetics of the nearby coastal communities is predicted to be negligible.
- Routine lighting associated with the activity will only be present temporarily, and flaring will be limited to 120 hours per well, and are fully recoverable.
- Impacts on local squid fisheries will be localised and temporary.

6.4.5.4. Cultural Environment

The routine operational light EMBA is located mostly in the offshore marine environment, although it approaches and overlaps the coastline at King Island, Tasmania and the Victorian coastline closest to the VIC/P79 operational area at Port Fairy (refer to Table 6-12 above for coastal community locations). As described in the existing environment chapter, Sea Country connection extends far beyond the current shoreline. Therefore, the Light EMBAs overlap Sea Country for the duration of the operations, and overlap Country (or Land Country) at discreet locations.

Changes to the physical environment, such as changes to light levels, are not specifically listed as an issue of concern in the Kooyang Sea Country Plan (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation 2004). However, environmental protection and the general health of the country are considered a key issue. The Plan focuses on integration of First Nations people's voices into the management and protection of the environment, and research needs to allow for effective on-going management and protection (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation 2004).

During consultation, ConocoPhillips Australia was made aware of the cultural significance of the Endangered Tasmanian wedged-tailed eagle (Org ID: 54, Event ID: 4215). The Threatened Tasmanian Eagles Recovery Plan 2006-2010 (DPIW 2006) identifies key threats associated large-scale plantation development, particularly where native forest conversion is involved, reducing the quality of foraging habitat by reducing prey availability and subsequently reducing productivity. A change in ambient light associated with short-term flaring (maximum of 120 hours per well), is not predicted to increase existing pressures on this species or affect its recovery, with no long-term or population level impacts predicted.

The evaluation of impacts to the ecological environment concludes an inherent consequence of Minor (2) for birds, including the culturally significant short-tailed shearwater, and marine reptiles. Based on this, no long-term or population level impacts are predicted to seabirds and shorebirds, and light emissions will be managed through the implementation of control measures so as to not impact on the recovery of the orange-bellied parrot as per the recovery plan (DELWP 2016). The orange-bellied parrot is not specifically identified as a species of cultural significance, although First Nations people regard the ecosystem in a more holistic manner than individual species.

Several communities located on King Island and along the Victoria coastline are within the Flaring EMBA, meaning that during flaring (up to 120 hours per well) there will be an increase in light intensity at some of these locations (depending on the drilling location) of approximately <0.01 lux, less than the light from a quarter moon in the night sky. Light intensity increases will be short term, and light levels will return to normal immediately after flaring is complete at each well location.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by light emissions.

Impacts to the ecological environment, socio-economic receptors and associated cultural values from routine light and flaring light emissions from exploration activities will be localised and temporary, with a consequence severity of **Minor (2)**, with no lasting changes predicted to local communities or seabird, shorebird, orange-bellied parrot or Tasmania wedge-tailed eagle populations.

6.4.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context B** has been applied:

- Impacts are relatively well understood, and uncertainty has been managed through modelling
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Additional control measures have been considered to ensure higher-order impacts are managed to ALARP and acceptable levels.

Table 6-13 documents the assessment of control measures and ALARP demonstration for Light Emissions.

Table 6-13: Light emissions control measures and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
CM01: Marine Assurance Process	AMSA Marine Orders 21 and 30 for the safety of navigation and prevention of collisions require that onboard navigation, watchkeeping, radar equipment, and lighting meets the International Rules for Preventing Collisions at Sea (COLREGs) and industry standards. In addition, workplace lighting is required to support safe working conditions at night in accordance with health and safety requirements.
CM02: Vessel and MODU Operating Procedures CM07: Light Management Plan	The National Light Pollution Guidelines for Wildlife provide management options for mitigating the effect of light to seabirds. A review of the management options relevant to the activity is provided in the additional controls section. ConocoPhillips Australia will contract a suitably qualified specialist to develop and support the implementation of a Light Management Plan as per the National Light Pollution Guidelines for Wildlife (CoA 2023) for the activity. Once safety navigational lighting requirements are met (as per vessel class), the Light Management Plan will detail additional mitigations to ensure artificial lighting is reduced to minimum levels based on the information in the Seabird Light Mitigation Toolbox (CoA 2023), wherever practicable, whilst maintaining safe working conditions and navigation. Specifically, outwards facing lighting will be reduced to minimum levels, wherever practicable. The Light Management Plan will be in place 30 days prior to the commencement of activities within the operational areas. [Section updated in response to Matter: B10]. In line with recommendations from NRE Tasmania, the principles outlined in the National Light Pollution Guidelines for Wildlife will be incorporated into the lighting design for the program through the implementation of a Light Management Plan to reduce the impacts of artificial light during night-

	time hours, along with monitoring and reporting of the impact (e.g. species and numbers impacted, nature of impact) (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 51).		
CM10: Well Testing Program	Minimise Flaring: Flaring will be limited to a maximum of 120 hours per well. Minimise Flaring at Night: For each well test, the initial flaring event will commence during daylight hours to reduce the impact of the initial event. However, the timing of subsequent events at each well will be determined by operational safety and testing requirements.		
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).		
Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Limit or exclude routine night-time operations.	Elimination of work lights associated with routine operations could result in a minor decrease in lighting.	Limiting routine operations to day-time hours would not eliminate the impact of artificial light required for navigation and safe stand-by operations at all times. Restricting night-time operations would increase the duration of the program and the associated environmental and health and safety impacts and costs while the rig remains on location, which are considered to be grossly disproportionate the reduction in impact.	Reject
Do not flare	Eliminates impact of artificial light on sensitive species.	In a success case, not being able to test the well compromises the objectives of the drilling program and would it make it extremely difficult to predict future steps. Flaring is a pre-requisite for declaring a discovery (which is the objective of this activity). The high costs associated with not being able to evaluate the well sufficiently, resulting in the need to drill an additional 'appraisal well' at a later date to obtain this data, are considered grossly disproportionate to the benefits of reduced temporary light.	Reject
Limit flaring to daylight hours only	Limiting flaring to day-time hours would eliminate the impact of artificial light from flaring during night-time hours when light is most apparent and potential impacts are greatest. This would potentially reduce adverse impacts where the flaring EMBA overlaps the nocturnal common diving petrel foraging BIA around Lady Julia Percy Island, the little penguin breeding BIA on Christmas Island between September and February, the fledging period for shearwaters late April early May, and the	Flaring is conducted to support the safe disposal of hydrocarbons during a well test. The duration of flaring is limited to a maximum of 120 hours over multiple short-term events per well. It is feasible to commence initial well testing during daylight hours to reduce the impact of the initial event at locations where the EMBA overlaps: 1. The nocturnal common diving petrel foraging BIA on Deen Maar (Lady Julia Percy Island), or 2. The little penguin breeding BIA on Christmas Island, Tasmania between September and February, 3. The probable migration route of the OBP. The timing of subsequent events at each well is determined by operational safety and testing requirements. Evaluation of trade-offs indicates that delaying flaring for 2 weeks by suspending the well with the reservoir open (the condition the well will	Adopt in part CM10: Well Testing Program

	orange-bellied-parrot migration route.	be in prior to flaring), presents an unacceptable risk to personnel, property and the environment. Delaying flaring in its entirety during the two-week period when shearwaters fledge could cost up to $14M in standby costs, and increases emissions and discharges over the period while the rig remains on standby, whilst presenting an unacceptable risk to personnel, property and the environment. [Updated in response to Matters: B10].	
Substitution			
Change lighting types aboard the MODU and vessels to those with less impact (e.g. use of motion sensors / timers, change colour of lights, reduced intensity and frequency of lighting)	Changing the colour, intensity, frequency and/or positioning of lighting could potentially reduce the adverse impacts of artificial light on certain fauna.	Navigation lighting colours and minimum lighting for crew safety are stipulated by law. Given the large variety of marine organisms that may be present and their varying sensitives to different light wavelengths, the control measure is not regarded as being practical and is likely to be of minimal overall benefit. The costs of replacing lighting are considered grossly disproportionate to the benefit gained.	Reject.
Reduction			
Manage the timing of the activity to avoid biologically sensitive periods	Reduces the risk of adverse impacts from light emissions during environmentally sensitive timing for listed marine fauna. The following seasonal timings were identified for the species that may be active at night within the light EMBAs: • Orange-bellied parrot: late February to early April (Australian Museum 2022b). • Common diving petrel: year-round (DCCEEW 2022a). • Little penguin breeding BIA on Christmas Island between September and February (Flaring EMBA only). • Short-tailed shearwater breeding BIAs on King Island.	The activity schedule is dependent on availability of the MODU, offshore survey vessels, and well sequence. The costs associated in moving or delaying the activity schedule are considered grossly disproportionate the benefit gained. Other controls have been identified to ensure lighting is reduced as part of normal practice, reducing impacts to all species, e.g. CM10 Well Testing. The common-diving petrel forages all year round, other species are present all year round or do not forage at night, thus restricting the activity timing does not afford any benefit to these species. Delaying flaring in its entirety during the two week period when shearwaters fledge could costs up to $14M in delays, increases emissions and discharges over the two week period while the rig remains on and presents an unacceptable risk to personnel, property and the environment. Consideration of additional controls specific to flaring is provided below.	Reject
Position the MODU away from sensitive areas (e.g. Lady Julia Percy Island, Christmas Island, King Island) to avoid adverse impact during flaring.	Re-directing the flare boom could reduce the amount of artificial light reaching sensitive receptors during flaring.	Orientation of the MODU (and boom) during flaring operations is determined by safe operational requirements. Evaluation of trade-offs indicates an unacceptable HSE risk associated with a reorientation of the boom based on receptors. Further, reorientation is likely to result in only minor reductions in light emissions. The HSE trade-offs are considered grossly disproportionate to the benefit gained.	Reject.

Shield gas flare on the MODU	Shielding the flare could reduce the amount of artificial light reaching sensitive receptors during flaring.	These are not standard fixtures. There would be significant time and cost to install a shield, and it could reduce safety of flaring operations. Flaring is necessary for safe evaluation. The cost of this control measure outweighs the minimal benefit this control measure would have.	Reject
Reduce gas flow rates to the flare	Reducing gas flow rates will minimise light emissions	Gas flow rates are determined by safe operational requirements. Evaluation of trade-offs indicates an unacceptable HSE risk associated with a reduction of flow rate. Further, reduction is likely to result in only minor decrease in light emissions. The HSE trade-offs are considered grossly disproportionate to the benefit gained.	Reject
Ensure vessels maintain a dark zone between the orange-bellied parrot migration pathway and the light sources during migration season.	Positioning vessels to minimise light emissions between the rig and the migration route could reduce the amount of artificial light reaching orange-bellied parrots during migration.	Position of vessels is determined by safe operational requirements. Evaluation of trade-offs indicates an unacceptable navigation and safety risk associated with the establishment of dark zones. Further, repositioning is likely to result in only minor reductions in light emissions. The HSE trade-offs are considered grossly disproportionate to the benefit gained.	Reject
Direct lights onto work areas and away from nesting areas where moveable / directional lights are installed.	Could reduce the potential impacts of artificial light on marine fauna.	Outward facing lighting is required for navigation/ safety/visibility at sea, in accordance with the COLREGS, Marine Order 21 and Marine Order 30. It is a regulatory requirement to have appropriate navigation lighting on all vessels from sunset to sunrise. Deck/workspace lighting will be inward/downward facing as far as reasonably practicable, see CM02 and CM07.	Adopt in part CM02: Vessel and MODU Operating Procedures CM07: Light Management Plan
Reduce / prevent indoor lighting from MODU and vessel reaching the outdoors (e.g. fixed window / porthole screens, blinds or window tinting).	Potential to reduce the impacts of artificial light upon marine fauna by reducing the amount of light leaving the MODU and support vessels.	High costs would be associated with a refit of lighting, windows etc. on the MODU and vessels. This action would be limited to the lighting systems not critical to safe operations. Evaluation of trade-offs indicates permanent block-out blinds or screens could impair the visual line-of-sight for supervisors monitoring safety-critical operations.	Reject.
Use of dark, matt surfaces on MODU and support vessels.	Reduces reflection and scattering of light that results in skyglow	Additional cost to repaint surfaces. Some areas may require lighter surfaces to manage heat conduction for health and safety. Unlikely to result in a material light reduction. The high financial cost would be grossly disproportionate to negligible environmental benefits. May compromise human health and safety in some circumstances.	Reject
Use bird deterrent systems during orange-bellied parrot migration	Could reduce impacts to migrating species by ensuring they do not fly close to the MODU and support vessels, in turn reducing the impact of light emissions.	Potential of deterrent system to disorientate/ adversely impact species further. Limited data to support the success of systems.	Reject.
Reduction of underwater lighting associated with ROV operations	Could reduce the impact to species by reducing the amount of artificial light emissions produced during the activities.	ROV operations within the activity will be temporary, with the use of artificial light being highly directional and occurring in close proximity to the subsea infrastructure. Any impacts to receptors are likely to be short-lived and localised. Inadequate lighting may cause operational risks and / inefficiencies of the ROV operation.	Reject.

Mitigation			
Design and implement a rescue program for grounded birds.	A rescue program will not prevent birds grounding, but it has been proven useful to reducing mortality of seabirds, and therefore, an environmental benefit. Preparedness for handling will also reduce safety risks to personnel.	Administrative costs of incorporating this program into induction package and implementation throughout activity. Crew will be instructed to remain vigilant for seabird collisions with the MODU and vessels (such as grounding on decks) and any observed/ discovered incidents will be recorded and reported within the environmental performance report (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 51). Good industry practice, environmental benefit outweighs additional cost.	Adopt. CM07: Light Management Plan
Implement light management actions during the breeding, nesting and fledgling periods.	Could reduce potential impacts of artificial light on certain fauna during sensitive breeding seasons.	The operational areas are, at the closest distance, approximately 17 km from islands or a coast where nesting and fledglings may be located. Impacts to breeding BIAs were only identified for 5 species for the flaring EMBA. Impacts from flaring will be short-term, intermittent and temporary, and therefore not expected to cause impact at a population level.	Reject.
Issue directions to minimise non-essential lights (e.g. close blinds, turn lights off when leaving a room etc.) during sensitive timing (e.g. OBP migration season) in MODU and vessel inductions / toolbox meetings.	Could reduce the amount of artificial light emitted and impacting upon sensitive receptors.	Administrative costs of preparing induction material. Control measure is feasible and cost effective with minimal effort for vessel / rig to implement and can be assessed during routine HSE inspections.	Adopt. CM07: Light Management Plan

Residual Impact Consequence Ratings	
Seabirds and Shorebirds	**Negligible (1)**
Orange-bellied Parrot	**Minor (2)**
Common Diving Petrel	**Minor (2)**
Marine Turtles	**Minor (2)**
Conservation Values and Sensitivities	**Minor (2)**
Socio-economic Receptors	**Minor (2)**
Cultural Environment	**Minor (2)**
ALARP Statement	The decision context has been assessed as Type B, with predictive uncertainty managed through light modelling. The residual consequence ratings are lower order - Minor (2). The adopted control measures minimise impacts from light emissions and are considered effective and appropriate to the temporary, small scale and reversible nature of the predicted impacts. The adopted engineering, procedural and administrative control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted impacts to receptors from light emissions associated with the Otway Exploration Drilling Program are reduced to ALARP.

6.4.7. Acceptability Assessment

Table 6-14 compares the impact levels of light emissions against the defined acceptable levels.

Table 6-14: Comparison of defined acceptable levels with impact levels for light emissions

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
Principles of ESD	Activities that result in temporary / reversible, small scale and/ or low intensity environmental damage. Environmental impacts have a worst-case consequence ranking less than Major (4).	Planned activities expected to result in **Negligible (1)** to **Minor (2)** residual impacts to relevant species.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/ irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes
Principles of ESD	**EPBC Program Requirements:** The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Light pollution is listed as a threat to bird and turtle species in the: • The South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013). The Zeehan Marine Park is classified as a Multiple Use Zone (VI) providing for general sustainable use by allowing activities that do not significantly impact on benthic habitats. • The National Recovery Plan for the Orange-bellied Parrot lists ‘barriers to migration and movement’ including illuminated structures and boats as a threat that poses a moderate risk and Action A2 requires that risks are assessed and managed if the risk rating warrants action. • The Wildlife Conservation Plan for Seabirds (DCCEEW 2020). • National Recovery Plan for albatrosses and petrels (2022) The following do not identify light as a threat: • Gould's Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan • Conservation Advice *Pachyptila turtur subantarctica* Fairy Prion (southern) • Conservation Advice *Pterodroma Mollis* Soft-plumaged Petrel (DoE 2015c) • Conservation Advice *Calidris canutus* Red Knot (DCCEEW 2024c) • Conservation Advice for *Calidris tenuirostris* (great knot) (DCCEEW 2024c) • Conservation Advice *Calidris ferruginea* Curlew Sandpiper (DCCEEW 2023b) • Conservation Advice *Numenius madagascariensis* Eastern Curlew (DCCEEW 2023a)	Yes

Defined Acceptable Levels		Predicted Impact Level		Is predicted impact below defined acceptable level?
Source	Level			
		• Conservation Advice *Thinornis rubricollis rubricollis* Hooded Plover (Eastern) (DoE 2014c). The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).		
Biological Ecological Economic Cultural	Undertake the activity in a manner that will not interfere with other marine and coastal users to a greater extent than is necessary for the exercise of right conferred by the titles granted. No death or injury to listed threatened and migratory species resulting from the exploration program. Biologically important behaviours within a BIA or outside a BIA can continue while the activity is being undertaken.	There are **Negligible (1)** to **Minor (2)** residual consequences associated with light emissions that are temporary, small-scale and reversible, which do not have the potential to result in long-term, serious or irreversible impacts.		Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted controls measures as listed above have been assessed to ensure that environmental impacts will be of an acceptable level throughout the exploration program.		Yes
	Environmental impacts and risks are consistent with environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).	Consequence	**Minor (2)** based on highest residual consequence rating	Yes
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to light emissions have been considered (with more detail provided in Section 3). These include: • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 51 – Impacts to seabirds, assessment in line with National guidelines, incident reporting • Org ID: 569, Tasmanian Climate Collective Event ID: 3469, FB ID: 346 – Impacts to short-tailed shearwater and its prey • Org ID: 569, Tasmanian Climate Collective Event ID 3469, FB ID: 435 – Impacts to eastern curlew • Org ID: 569, Tasmanian Climate Collective Event ID 3469, FB ID: 435 – Impacts to swift parrot • Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 378; Org ID: 569, Tasmanian Climate Collective Event ID 3469, FB ID: 435; Org ID: 553, Australian Parents For Climate Action (North Tas and Surf Coast),		Yes

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
		Event ID: 3257, FB ID: 342 – Impacts to orange-bellied parrot • Org ID: 5, Colac Otway Shire Council, Event ID: 582, Document ID: 1483 – Impacts to hooded plover • Org ID: 569, Tasmanian Climate Collective Event ID: 3469, FB ID: 346 – Impacts to prey species • Org ID: 471, Richey Fishing Co Pty Ltd Event ID: 536, FB ID: 11 – Attraction of squid • Org ID: 54, Event ID: 4215 – Cultural significance of Tasmanian wedge-tailed eagle • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • Org ID: 553, Australian Parents For Climate Action (North Tas and Surf Coast), Event ID: 3257, FB ID: 342; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 435 – Bogong moth	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	The management actions listed for seabirds in The National Light Pollution Guidelines for Wildlife (CoA 2023) have been considered.	Yes
Acceptability Statement	Decision-type B impacts are considered acceptable if the requirements in Table 6-15 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4). Further to this, following completion of the impact assessment process, the impact of light emissions from drilling and vessel operations on receptors is determined to be acceptable because: • Vessel and MODU lighting is required for safety and navigational purposes and will have negligible impacts to coastal communities • Flaring at night-time will be minimised to the extent possible • Light emissions will be managed in accordance with the National Light Pollution Guidelines for Wildlife and Wildlife Conservation Plan for Seabirds • Given the large distances covered by seabirds to forage, light from the operational area is not predicted to impact foraging behaviour • Light emissions are identified as a threat in National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2023e) but classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction. • Light emissions will be managed in a manner to not impact on the recovery orange bellied parrot as per the orange-bellied parrot recovery plan (DELWP 2016) • Light emissions are predicted to result in localised, short-term behavioural changes and are not predicted to result in long-term population level impacts to fish, plankton and prey species • Given that no long-term population-level impacts on productivity or viability are predicted, light emissions are not identified as, or predicted to be, a threat to the sustainability of commercial fisheries within the area, and		

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
	• The impacts of light emissions are temporary, small-scale and reversible, and have limited potential to result in long-term, serious, irreversible or cumulative impacts. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of light emissions. Although there is limited potential for successive, additive or synergistic impacts when considered in relation to other significant activities or projects over temporal and spatial scales, there is uncertainty associated with the potential for cumulative light impacts where the light EMBAs overlaps the nocturnal common diving petrel breeding BIA on Lady Julia Percy Island and the migration route for the orange-bellied parrot which have been assessed further in Section 8.		

6.4.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with light emissions from the Otway Exploration Drilling Program are:

- EPO1: Undertake the activity in a manner that will not interfere with other marine and coastal users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO4: Biologically important behaviours can continue while the activity is being undertaken.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

6.5. Atmospheric Emissions

6.5.1. Hazards

During community information sessions, ConocoPhillips Australia was asked why we need more gas if we are trying to address climate change (Document ID: 3923). Gas is a resource that is vital to our daily lives and our economy. It is used in the manufacture of many of the products we consume and is used to heat homes and businesses and generate electricity. The steep decline in gas being supplied in Victoria indicated new supply is required to ensure ongoing energy security.

It is important to note that the Otway Exploration Drilling Program is an exploration drilling program and is not proposing the installation of any permanent operating infrastructure that will deliver energy to users. ConocoPhillips Australia is required to assess the impact of emissions generated as part of the activity. Emissions within the scope of the proposed activity include:

- MODU and vessel operations (i.e. fuel usage)
- Aviation (i.e. helicopter) operations
- Flaring/venting operations (i.e. as a part of flow-back and well testing)
- Venting of holding tanks (i.e. following bulk solid transfer process), and
- Fugitive emissions.

Atmospheric emissions of greenhouse gases (GHG) released from the activities defined within this EP are forecast to be up to a maximum of 247 kt CO_2-e over the life of the project from 2024 to end 2028 (Appendix J). This emissions estimation assumes multiple worst-case conditions, i.e. the longest possible drilling duration for each well and maximum flaring duration and rates on each well. Direct GHG emissions from vessels, flaring, the MODU and helicopters represent 37.6%, 35.1%, 26.7%, and 0.6% of the total emissions, respectively. Flaring will only occur for short periods in the event that hydrocarbons are discovered and well testing is conducted. Consequently, the total expected direct GHG emissions are estimated to be approximately 106 kT CO2-e over the project life assuming realistic operational condition (typical drilling duration at a maximum of 6 wells and flaring of only two wells at maximum duration and rates). [Paragraph updated in response to Matter: CL01].

Fugitive emissions are very small volumes of typically gases or vapours which are released from pressure-containing equipment such as valves, piping flanges, pumps, storage tanks, compressors, etc. Volumes are kept to a minimum through upkeep of machinery aboard the MODU and vessels, during implementation of the planned maintenance system.

As per the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (2004), only Scope 1: GHG emissions, emissions that a company makes directly, are emitted during the exploration activity, i.e., from the combustion of Marine Diesel Oil (MDO) during operations and from flaring in the event of well testing. The GHG emissions estimation for the activity was calculated using the National Greenhouse and Energy Reporting (Measurement) Determination 2008 methodology made in accordance with the National Greenhouse and Energy Reporting Act 2007 (NGER Act) (DCCEEW 2022d). This calculation was updated in February 2024 in response to feedback from public comment [Matter: CL01] to account for the embodied energy in the materials used during the Otway Exploration Drilling Program.

6.5.2. Environmental Impacts

During consultation, relevant persons queried the composition of emissions from routine operations and flaring (Org ID: 593, Event ID: 3133, FB ID: 258; Org ID: 54, Event ID: 3789, FB ID: 353). The release of atmospheric emissions (gaseous GHG emissions), such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), along with non-GHG emissions, such as sulphur oxides (SOx) and nitrogen oxides (NOx), can result from the operation of the MODU and vessel engines, helicopters, generators, fixed plant, equipment and during flaring. Small quantities of dry cement will also be released whilst the holding tanks are venting after the transfer of bulk solids.

The release of these emissions has the potential to:

- Cause a localised change in ambient air quality due to the release of gaseous emissions and particulate matter, and
- Contribute to national GHG emissions.

6.5.3. Defining the Environment that May Be Affected (EMBA)

Table 6-15 describes the basis for defining the EMBA for atmospheric emissions, including supporting sources of information and the resultant spatial extent.

Table 6-15: Atmospheric emissions EMBA definition

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
Atmospheric Emissions	Operational area	Changes to air quality will be limited to the localised air shed, which will be within the operational area. Scope 1 emissions (i.e., direct emissions from the project) will contribute to the global increase of GHG emissions.	The accumulation of GHG emissions in the atmosphere has been shown to contribute to climate change (CSIRO 2022b; BOM 2022, IPCC 2022). Climate change impacts occur at a global scale over a long timeframe and cannot be attributed	2 km around each well location or survey area

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
			to any single source of emissions or specific activities.	

6.5.4. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of impacts associated with atmospheric emissions, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values include social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

6.5.4.1. Air Quality

A change in air quality within the operational areas may impact receptors such as:

- Air quality
- Seabirds, and
- Coastal settlements.

6.5.4.2. Greenhouse Gas Emissions

Climate change associated with an increase in GHG emissions has been shown to impact various values and sensitivities within Australia, such as:

- Marine, terrestrial and wetland ecosystems
- Physical environment (i.e., oceanography, water quality, climate)
- Biological habitats and communities
- Socio-economic environment (e.g., fisheries and aquaculture), and
- Cultural environment.

It is important to acknowledge that climate change impacts cannot be directly attributed to any one activity. Rather they are the result of global GHG emissions minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution began.

6.5.5. Consequence Evaluation

Impacts from a reduction in air quality are expected to be a short-term, localised and limited to the immediate vicinity of the release.

The proposed activity will contribute to national GHG emissions.

6.5.5.1. Air Quality

Exploration activities may result in a temporary, localised reduction of air quality within the environment immediately surrounding exhaust points.

The combustion of MDO can create continuous or discontinuous plumes of particulate matter (soot or black smoke) and the emission of non-greenhouse gases such as sulphur oxides (SOx) and nitrous oxides (NOx). Inhaling this particulate matter can affect human health in close proximity (e.g. aggravating respiratory illnesses such as asthma). Similarly, the inhalation of particulate matter may affect the respiratory systems of fauna, such as seabirds overflying exhaust points.

Combustion gases and particulate matter released from exploration vessels or the MODU are not predicted to impact on the health or amenity of the nearest human coastal settlements (e.g. Port Fairy approximately 19 km from VIC/P79 and King Island approximately 28 km from T/49P), or the Kennaook/Cape Grimm Baseline Air Pollution Monitoring station located at Woolnorth Point, Tasmania, as emissions will be rapidly dispersed and diluted by offshore winds. This rapid dispersion and dilution will also ensure that seabirds are not exposed to concentrated gaseous plumes or particulate matter from exhaust points.

The consequence severity of potential reductions in air quality associated with atmospheric emissions from exploration activities is assessed as **Minor (2)**, based on:

- Atmospheric emissions are anticipated to result in a localised and temporary reduction in air quality, which will rapidly disperse given the open ocean environment and prevailing winds of the Otway Basin.
- Impacts to coastal communities (closest to VIC/P79 and T/49P being Port Fairy, Victoria and King Island, Tasmania respectively) are not predicted.
- Flaring is a necessary safety control required during short-term well tests. Given the limited duration and intermittent nature of flaring operations (maximum of 40 MMscf flow rate for 120 hours per well over multiple short-term events) no substantial or cumulative impacts to air quality are predicted.
- Atmospheric emissions are expected to be similar to other vessels operating in the region for both petroleum and non-petroleum activities.
- Atmospheric emissions are not expected to affect the quality of data at the Kennaook/Cape Grimm Baseline Air Pollution Monitoring station located approximately 110 km to the south-east of the most southerly part of the T/49P operational area, given the significant distances and predominance of westerly winds, and
- Atmospheric emissions from exploration activities are not predicted to affect the achievement of the National Environmental Protection Measure for Ambient Air Quality (NEPM AQQ) (NEPC 2021) protection goals.

6.5.5.2. Greenhouse Gas Emissions

The use of fuel to power engines, generators and any mobile/fixed plant and flaring during well testing will result in gaseous GHG emissions. The total expected direct GHG emissions are estimated to be approximately 106 kT CO2-e over the project life assuming realistic operational condition (typical drilling duration at 6 wells and flaring of only two wells at maximum duration and rates). Emissions from vessels, flaring, MODU and helicopters represent approximately 42%, 28%, 22% and 0.6% of emissions, respectively. Assuming all six wells were drilled in a year, this emissions estimate would represent approximately 0.02% of the annual Australian GHG emissions of 488 Mt CO2-e in 2021 (Department of Climate Change, Energy, the Environment and Water, 2022). While these emissions add to the GHG load in the atmosphere, they are small when compared to national emissions and insignificant on a global scale and are not predicted to have determinable impact. The activity is similar to other shipping and industrial activities contributing to the accumulation of GHG in the atmosphere. [Paragraph updated in response to Matter: CL01]

Accidental release and fugitive emissions of ozone-depleting substances (ODS) have the potential to contribute to ozone layer depletion, attributing to increased ultraviolent radiation reaching the earth's surface from the sun, further accelerating global warming and climate change (WMO 2022). Though fugitive emissions are known to occur, given the short duration of the activity and the high energy airshed, the small volume of fugitive emissions will be quickly dissipated and is not considered a risk to air quality.

Physical Environment

Anthropogenic driven climate change has been demonstrated to result in changes in the frequency and intensity of extreme weather events such as droughts, floods, heatwaves, storms and fire, impacting ecosystem's composition, resilience, and function (IPCC 2022).

Climate change has been attributed to fundamental changes to the physical and chemical characteristics of the ocean, such as ocean warming, sea levels rising, acidification and deoxygenation (IPCC 2022). Sea surface temperatures have increased globally over recent decades and are expected to continue to rise. Estimates of warming in the Southern Tasman Sea of between 0.6 to 0.9°C, and between 0.3 to 0.6°C elsewhere along the Australian coast, are predicted by 2030 (Church et al. 2006).

Ecological Receptors

Climate change can result in a range of impacts to specific species, environments and ecosystems within Australia. It is important to acknowledge that climate change impacts cannot be directly attributed to one activity, as they are the result of global emissions that have accumulated within the atmosphere over time.

The impacts from climate change are highly species-dependent and spatially variable. Some impacts which are already apparent include changes to biodiversity, such as shifts in genetic composition, changes to migration patterns, altered lifecycles and reduced reproduction rates of certain species (Steffen et al. 2009). The increase in the frequency and intensity of extreme weather events has been shown to impact population dynamics, species boundaries, morphology, behaviour, reproduction and ecosystem composition, resilience and function (IPCC 2022).

In the marine environment, changes to the physical and chemical characteristics of the environment can result in alterations to species distribution, abundance, seasonal timing, habitat loss, extinction, population declines and increases in the frequency and intensity of thermally induced coral bleaching events (IPCC 2022; CSIRO 2022b; BOM 2022). Increasing acidity, from CO_2 being absorbed by oceans and fresh water, increases the solubility of calcium carbonate, which is the central component of the skeletal material in aquatic organisms (Steffen et al. 2009).

Furthermore, species are globally shifting polewards driven by heat increases, shifts in seasonal timings and ecosystem changes, causing multiple losses of local species, mass mortality events, and loss of specific ecosystems such as kelp forests (IPCC 2022). The shift will have adverse socio-economic consequences on certain activities which rely on these species such as aquaculture and fisheries.

Socio-economic Receptors

Socio-economic impacts resulting from climate change include impacts to the functions, interests or activities of other users who rely on specific ecological values that may experience adverse impacts, such as commercial and recreational fisheries and aquaculture.

Climate change may impact marine crustacean populations by intensifying habitat loss and interfering with feeding, moulting, reproductive performance, biochemical compositions, behaviour, movement and survival (Azra et al. 2022).

Crustacean responses to climate change vary by species, life-history stage, reproduction status and geographical distribution. For example, research on the southern rock lobster has shown they can increase their resilience to warmer water temperatures (Oellermann et al. 2022). However, the southern rock lobster is restricted by the inability to shift their range further south due to a lack of coastal habitat. Consequently, the main threat from climate change is expected to be climate driven competition with the increasingly abundant eastern rock lobster as it expands its range south (Oellermann et al. 2022).

Conservation Values and Sensitivities

The Zeehan Commonwealth Marine Reserve (Special Purpose Zone and Multiple Use Zone – IUCN Category VI), and the Apollo Commonwealth Marine Reserve (Multiple Use Zone – IUCN Category VI) are the closest marine reserves to the operational areas. The values of these marine reserves include ecological receptors that may be sensitive to the impacts of climate change.

The South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) does not specify climate change as a main pressure; however, it does identify that the effects are unpredictable and may include shifts in major currents, rising sea levels, ocean acidification and changes in the variability and extremes of climatic features (e.g. sea temperature, winds, and storm frequency and intensity) (DNP 2013). The Plan states that there is a high level of uncertainty about the effects that climate change related pressures will have on the conservation values protected by the South-east Commonwealth marine reserves.

Cultural Environment

Impacts to cultural heritage sites and places of spiritual importance in coastal locations may also be experienced due to rising sea levels. Sea levels have been estimated to have risen on average by 1.2 mm per year between 1920 and 2000 due to climate change (Church et al. 2006). By 2100, research is expecting sea levels to have increased by a further 18 to 59 cm in response thermal expansion and melting of icesheets (Solomon et al. 2007).

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by atmospheric emissions.

Whilst the release of GHG emissions is known to contribute to global climate change, the amount estimated to be released as a result of exploration activities is insignificant on a global scale and is not expected to have determinable impacts (Org ID: 593, Event ID: 3129, FB ID: 229, 301, 336; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 28).

The consequence severity of GHG emissions from the Otway Exploration Drilling Program on the physical, ecological, conservation, socio-economic and cultural receptors and values described above is assessed as **Minor (2)**, based on:

- Although emissions of GHG such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) during the activity will add to the GHG load in the atmosphere, they represent an insignificant contribution on a global scale and are not expected to have determinable impacts. Consequently impacts are not predicted to:
  - Species with conservation management plans that identify climate change as a threat, or
  - Commercially important species with the giant crab and southern rock lobster fisheries in Victoria, and the southern rock lobster fishery in Tasmania having stock listed as a sustainable status (FRDC 2020; 2020a) and neither have a EPBC threatened status, therefore, any minor impact is unlikely to affect the productivity of either population, or
  - The South-east marine region, with the Commonwealth Marine Reserves Network Management Plan stating that there is a high level of uncertainty around the effects that climate change may have upon the conservation values protected by the reserves (DNP 2013)).

- Maintenance of equipment containing ozone depleting substances is controlled to ensure the likelihood of an accidental release or fugitive emissions is minimised.
- In the case of this EP there is no resource extraction component to the activity and future regulatory approvals, including consideration of indirect consequences and appropriate coverage of GHG emissions, are required prior to any activity with a resource extraction component occurring.

6.5.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context A** has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower-order impacts are managed to ALARP and acceptable levels.

Table 6-16 documents the assessment of control measures and ALARP demonstration for atmospheric emissions.

Table 6-16: Control measures for atmospheric emissions and ALARP assessment

Adopted Control Measures	
Control	**Source of good practice control measure**
CM01: Marine Assurance Process	Vessels and MODU will comply with Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution (appropriate to vessel class) for emissions from combustion of fuel, including: • Hold a valid Air Pollution Prevention (APP) certification or equivalent in accordance with MARPOL Annex VI. • Vessels will use low sulphur fuel in accordance with Marine Order 97: Marine Pollution Prevent – Air Pollution (Division 7). • National (AMSA) and International (IMO / MARPOL) Emissions and Discharge Standards for vessels • Have a Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL 73/78 Annex VI. • Engine NOx emission levels will comply with Regulation 13 of MARPOL 73/78 Annex VI. • Only MARPOL VI-approved waste incinerators shall be used to incinerate solid combustible waste (food waste, paper, cardboard, rags, plastics). • ODS handling procedures as per MARPOL Annex VI, including maintenance of ODS record book where rechargeable systems containing ODS are recharged or repaired. A documented maintenance program is in place for equipment on MODU, vessels and ROV that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures.
CM02: Vessel and MODU Operating Procedures	Bulk solids transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release of bulk product (powder) to sea during tank venting. The procedures include standards for: • Certified equipment with checked integrity (e.g. hose and valves). • Transfer process (e.g. safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details).

	• Fuel use will be monitored and recorded, and combustion emissions calculated and reported.		
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).		
CM10: Well Testing Program	Flaring durations and hydrocarbon volumes flared will be recorded and combustion emissions calculated and reported. Flaring will be limited to a maximum of 120 hours per well.		
CM11: Procurement Vetting Process	A flaring system and air compressors will be used to atomise hydrocarbons to minimise smoke during combustion and aid in the reduction of atmospheric emissions. A minimum standard for the destruction efficiency of the flare will be specified in the minimum equipment requirements.		
Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Do not use marine diesel oil	Eliminates the release of by-products of combustion	Fuel use and the associated atmospheric emissions cannot be eliminated as fuel is a fundamental requirement for the activity.	Reject
Do not conduct well testing	Eliminates all emissions associated with well testing (i.e. flaring)	Well testing is a central component of the activity as it is required to confirm the existence of transportable hydrocarbons, evaluate reservoir characteristics and flow rates, assess non-hydrocarbon components, measure liquid yields, and obtain representative fluid samples.	Reject
Conduct wireline extended reservoir evaluation (instead of well test)	Reduced GHG emissions in comparison to a conventional well test (DST – Drill stem test)	Evaluation of trade-offs indicates this is an inferior testing process and may still require a well test to be conducted afterwards. Requires venting of reservoir gas, although volumes are significantly less and present a substantial reduction in GHG emissions, with a reduced test duration, no flaring and associated light emissions. This test is feasible to implement, and costs are not grossly disproportionate to potential benefit, but further investigation is warranted to minimise the risk of a subsequent well test being required.	Adopt if suitability of method for application to specific reservoir is confirmed. Drilling Program
Prohibit use of ODS (ozone depleting substances)	Eliminates emissions associated with ODS activities during the Project.	Increase in health risk from storage of wastes. Increase in risk due to transfers (increased fuel usage, potential increase in collision risk, disposal on land).	Reject
No bulk product (powder) transfers	Eliminates impacts to air quality from unintentional release.	Bulk product is required to perform the activity and transfers of bulk product are required. Transfer activities are carried out in accordance with MODU owner's procedures to reduce the risk of an unintentional release.	Reject
Substitution			
Use alternative fuels	May reduce emissions associated with the combustion of MDO.	The MODU and vessels use MDO to power their engines and equipment. MDO has low sulphur content which is important for managing	Reject

		impacts. No other alternative fuel sources are currently commercially viable for larger vessels or helicopters. The cost to transition to alternatives fuels is grossly disproportionate to the benefits gained.	
Use incinerators / engines with higher environmental efficiency	Reduces project emissions associated with incinerators/ engines.	Significant cost in changing equipment. Evaluation of trade-offs indicates emissions associated with manufacturing, transport, replacement and disposal of equipment is likely to diminish any benefit. Costs are grossly disproportionate to the benefit.	Reject
Reduction			
Only conduct flaring operations during day light hours	Provides for breaks in emissions associated with flaring by restricting the hours it can be conducted, potentially reducing impacts.	Although initial well testing can be scheduled to occur in daylight hours, the timing of subsequent events (at each well) will be determined by operational safety and testing requirements.	Reject
Reduce number of support vessels	Reduces emissions	The number of support vessels (up to 3) is based on industry practice to support safe and efficient operations. Reduced vessel support would extend operations and associated impacts, with costs grossly disproportionate to the benefit gained.	Reject
Use of 'Green Burning' flaring technique for flaring operations	A flare using air compressors to atomise hydrocarbons will yield smoke free combustion and aid in the reduction of atmospheric emissions.	Operational and logistical costs of equipment and implementation are not disproportionate to the benefit gained.	Adopt CM11: Procurement Vetting Process

Residual Impact Consequence Ratings	
Air Quality	**Minor (2)**
Greenhouse Gas Emissions	**Minor (2)**
ALARP Statement	The decision context has been assessed as Type A and the residual consequence ratings are lower order - Minor (2). The adopted control measures minimise impacts from atmospheric emissions and are considered effective and appropriate to the temporary and small-scale nature of the predicted environmental impacts. The proposed control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted impacts to receptors from atmospheric emissions associated with the Otway Exploration Drilling Program are reduced to ALARP.

6.5.7. Acceptability Assessment

Table 6-17 compares the impact levels of atmospheric emissions against the defined acceptable levels.

Table 6-17: Comparison of defined acceptable levels with impact levels for atmospheric emissions

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
Principles of ESD	Activities that result in temporary /reversible, small scale, and/	Planned activities expected to result in **Minor (2)** residual impacts.	Yes

Defined Acceptable Levels		Predicted Impact Level		Is predicted impact below defined acceptable level?
Source	Level			
	or low intensity environmental damage. Environmental impacts and risks have a worst-case consequence ranking less than Major (4).			
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.		Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	The following published material identifies climate change as a threat to the relevant threatened and migratory species within the operational area: • National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e) • Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015d) • National Recovery Plan for the Orange bellied Parrot *Neophema chrysogaste* (DELWP 2016) • Recovery plan for marine turtles in Australia 2017 – 2027 (CoA 2017) • Blue Whale Conservation Management Plan 2015 – 2025 (DoE 2015) • Southern Right Whale Conservation Management Plan 2022-2021 (DSEWPaC 2012b) • Conservation listing Advice: *Megaptera novaeangliae* Humpback Whale (TSSC 2022) • Conservation Advice *Balaenoptera* (sei whale) (TSSC 2015c) • Conservation Advice for *Balaenoptera physalus* (fin whale) (TSSC 2015d) • Recovery plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a)		Yes
Biological Ecological Economic Cultural	No substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity. No unplanned objects, emissions or discharges to sea or air. No detectable change to the air quality of coastal communities.	There is a **Minor (2)** consequence of temporary and small-scale impacts from atmospheric emissions which do not have the potential to result in long-term, serious or irreversible impacts.		Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted controls measures as listed above have been assessed to ensure that environmental impacts will be of an acceptable level throughout the exploration program.		Yes
	Environmental impacts and risks are consistent with	Consequence	**Minor (2)**	Yes

Defined Acceptable Levels		Predicted Impact Level		Is predicted impact below defined acceptable level?
Source	Level			
	environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).			
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to atmospheric emissions have been considered (with more detail provided in Section 3). These include: • Document ID: 3923 – Need for gas supply • Org ID: 258, Event ID: 3133, FB ID: 258; Org ID: 54, Event ID: 3789, FB ID: 353 – Composition of emissions during flaring • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 229, 301, 336; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 28 – Greenhouse gas emissions • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage Further objections and claims were raised that were not relevant to the adverse effects of the proposed Otway Exploration Drilling Program to which the Environment Plan relates.		Yes
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Fuel use and flaring volumes will be recorded and reported. The activity will comply with Marine Order 97 (Marine pollution prevention – air pollution), which gives effect under Australian law to Australian Marine Order 97. There are no legislative requirements regarding the level or duration of atmospheric emissions during flow-back and well testing (flaring operations).		Yes
Acceptability Statement	Decision-type A impacts are considered acceptable if the requirements in Table 6-17 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4). Further to this, following completion of the impact assessment process, the impact of atmospheric emissions from drilling and vessel operations on receptors is determined to be acceptable because: • Good practice controls including Commonwealth, international and Industry standards, guidelines and requirements are clearly defined and will be implemented. • GHG emissions from the project are small-scale, insignificant on a global scale and are not expected to have determinable impacts. • Emissions are predicted to result in a localised and temporary reduction in air quality, which will rapidly disperse given the open ocean environment and prevailing winds of the Otway Basin. • Emission impacts are not expected to result in exceedances of the Ambient Air Quality NEPM or affect air quality data. • The temporary, localised and small-scale impacts associated with atmospheric emissions are considered to be of an acceptable level, given the existing condition the receiving environment, and			

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
	• Atmospheric emissions associated with the exploration program do not have the potential to result in long-term, serious, irreversible or cumulative impacts, with limited potential for successive, additive or synergistic impacts, given the amount released is insignificant on a global scale and is not expected to have determinable impacts. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of atmospheric emissions on all identified receptors. Based on the above evaluation, impacts associated with atmospheric emissions meet the defined acceptable levels.		

6.5.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with atmospheric emissions from the Otway Exploration Drilling Program are:

- EPO5: No substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity.
- EPO7: No unplanned objects, emissions or discharges to sea or air.
- EPO8: No detectable change to the air quality of coastal communities (Org ID:72, King Island Shire Council, Event ID: 4014, FB ID: 438).

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

6.6. Underwater Sound Emissions – Non-Impulsive

6.6.1. Hazards

Sound emissions can be categorised as non-impulsive (continuous) or impulsive. Continuous sound is a category of sound that is described by a continual non-pulsed sound. Continuous sound can be tonal, broadband, or both (Southall et al. 2007). Impulsive sound sources, including those associated with seabed survey geophysical techniques and well evaluation techniques, are assessed in Section 6.6.10.

The Otway Exploration Drilling Program will generate continuous underwater sound emissions as a result of vessel, MODU, drilling and aircraft operations.

Vessels generate continuous sound from propellor cavitation, thrusters, hydrodynamic flow around the hull, and operation of machinery and equipment. Sound from support vessels operating during drilling activities has been assessed to determine the cumulative impact of multiple continuous sound sources in close proximity.

The MODU will generate sound from onboard equipment vibrations (e.g. pumps, generators and machinery), and a smaller portion transmitted directly via the vibrating drill during drilling.

The MODU may operate a thruster assisted mooring system to mitigate mooring fatigue in heavy sea states. This system generates variable non-impulsive sound during infrequent operation of one up to six thrusters in response to feedback from the mooring system. A review of 33 months of historical operational data from the North Sea indicates thrusters are typically not active (>96% of the time) and utilisation is otherwise limited low loads across a small number of thrusters for short periods, (typically hours) in response to metocean conditions.

In addition, sound will be generated by aircrafts (primarily helicopters) during take-off and landing on the MODU and by the ROV, as described below.

ROV

During the activities associated with the drilling, notably inspections of the seabed prior to and/or after drilling, and in the event of dropped objects, ROVs may be used. This will be undertaken from a vessel or MODU and the noise generated will typically be of considerably lower intensity than vessel noise.

Based on such intermittent use of ROV operations undertaken from a vessel or MODU, ROVs are anticipated to make little contribution to the overall noise emissions associated with MODU and/or vessel activities. The consequence to marine fauna has been assessed as **Negligible (1)** and have not been assessed further.

Helicopters

Aircraft may be used for crew changes, critical equipment supply, surveillance and emergency response uses. Helicopter operations are the only planned aircraft activity during normal operations and are expected to occur several times per week. The presence of the helicopter and its associated sound field will be highly transient. Upon landing, the helicopter will descend to the helideck where there is greatest potential to ensonify the water column. Sound pressure will be greatest at the sea surface and rapidly diminish with increasing depth.

Helicopter engine sound is emitted at a range of frequencies generally, below 500 Hz (Richardson et al. 1995). Richardson et al. (1995) reported helicopter sound (for Bell 214 type) being audible in air for four minutes before it passed over receivers, but only detectable underwater for 38 seconds at 3 m depth and for 11 seconds at 18 m depth for the same flight path. Thus, the predicted extent of impact is between 3 to 18 m for a period of 11 – 38 seconds twice (landing and take-off) on days when crew changes occur (several times per week). Based on such short-term, intermittent sounds the consequence to marine fauna has been assessed as **Negligible (1)** and have not been assessed further.

6.6.2. Underwater Sound Modelling

Ambient sound levels in the Otway Basin have been measured as part of previous impact assessment activities for the petroleum industry. Acoustic monitoring conducted by Santos (2004) recorded broadband underwater sounds of 93 to 97 dB re 1 µPa. Passive acoustic monitoring, commissioned by Origin, conducted 5 km offshore from the coastline east of Warrnambool, identified that ambient underwater sound in coastal areas are generally higher than offshore waters, with a mean of 110 dB re 1 µPa and maximum of 161 dB re 1 µPa (Duncan et al. 2013).

MODU and Vessels

Jasco Applied Sciences (JASCO) were contracted to undertake a modelling study of underwater sound levels associated with the ConocoPhillips Australia exploration program. Underwater sound emissions will be generated by vessels (engine sound associated with transit and dynamic positioning (DP) operations), the action of the drill whilst drilling and machinery, pumps, and generators onboard the MODU and vessels (Erbe et al. 2013).

The use of DP systems for maintaining a stationary vessel during certain activities was identified during consultation as likely to be the noisiest activity associated with the Otway Exploration Drilling Program

(Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 40). During the seabed survey, one or two vessels will be undertaking activities operating at slow speeds or using DP to maintain position. While drilling, at least one support vessel will be within the drilling area (2 km around each well location) to support the MODU. This vessel will either be stationary, using DP to maintain position or operating at slow speeds whilst undertaking activities.

JASCO conducted modelling for activities across three broad areas during the exploration program, the northern extent of VIC/P79, the southern extent of VIC/P79 and across T/49P (Matthews et al. 2023: Appendix G). The considered locations were selected to estimate sounds levels that would be representative of all locations within the operational areas based on water depth, proximity to the coast and continental slope, and seabed type. The results presented below represent the maximum distance from locations within the VIC/P79 and T/49P operational areas, to represent the range of predicted impacts.

JASCO undertook additional modelling to assess the likely differences in underwater sound associated with continuous sound sources at a range of locations, including some in deeper waters. This assessment found that sites not immediately at the shelf edge had ranges to thresholds that were generally consistent, despite varying water depths (see Appendix G).

Close to the shelf edge, JASCO detailed that the seabed geology changes to be more reflective, with a down sloping bathymetry resulting in extended sound ranges to thresholds in the offshore direction. The effect that proximity to the shelf edge makes to sound propagation was modelled within the VIC/P79 operational area.

Based on a review of planned activities, six operational scenarios were initially identified as possible combinations of drilling and vessel activities resulting in continuous sound emissions during the activity (JASCO 2022). This list was refined to reflect more credible activity combinations for modelling conducted for VIC/P79 and further subsets of activities were assessed for a representative shelf-edge location to allow comparison with typical on-shelf conditions. Table 6-18 summarises the six modelled scenarios for T/49P, the four scenarios carried through the VIC/P79 assessment, the two scenarios applied to the representative shelf-edge location (see Appendix G for further details).

Table 6-18: Modelled underwater continuous sound scenarios

No.	Scenario	Description
1**	Anchor Pre-lay	Pre-lay operations by an Anchor Handler Tug Supply (AHTS) vessel working on site.
2	Mooring	Mooring operations where an anchored MODU is idle, one AHTS is keeping position on the bridle using DP, and two AHTS are working on site within 2 km of the MODU.
3*	MODU	Drilling operations from an anchored MODU.
4*	MODU, Supply Vessel	Drilling operation from an anchored MODU with an AHTS conducting resupply operations, using DP.
5**	MODU, Standby Vessel	Drilling operations from an anchored MODU with a AHTS on standby within 2 km.
6	MODU, Supply and Standby Vessels	Drilling operation from an anchored MODU with an AHTS conducting resupply operations, using DP, and a AHTS transiting at low speed within the standby area, 2 km from the MODU.

* Scenarios not carried through to assessment for VIC/P79 as operational likelihood is limited, e.g. MODU operating in isolation without standby vessel.
** Scenarios assessed at representative shelf-edge location.

To assess the cumulative sound field over a 24 hour period, an indicative area (2 km wide × 4 km long) was defined for the standby vessel to the side of each well location. Within the defined area, the vessel was considered to be at randomly seeded locations to best approximate real-world activities, and thus approximate representative sound fields for activities. The JASCO modelling report (Appendix G) details the location of the defined area relative to the MODU.

6.6.3. Exposure Criteria Thresholds

JASCO performed modelling studies which assessed distances from activities (Table 6-18) where underwater sound levels reached exposure criteria corresponding to various levels of potential impact to marine fauna. The marine fauna considered was based on a review of receptors that may be impacted by continuous sounds, including marine mammals, marine turtles, fish (including fish eggs and larvae), and invertebrates. The following exposure criteria thresholds were selected for modelling and impact assessment based on current best available science and acceptance by regulatory agencies:

- Peak pressure levels (PK) and frequency-weighted accumulated sound exposure levels (SEL24h) from the US National Oceanic and Atmospheric Administration (NOAA) Technical Guidance (NMFS 2018) for the onset of permanent threshold shift (PTS) and temporary threshold shift (TTS) in marine mammals that may be undertaking biologically important behaviours, such as calving, foraging, resting or migration (as defined by DoE 2015b).
- The current interim NMFS (NOAA 2019) criterion of 120 dB re 1 µPa for non-impulsive sound sources, such as vessels, is used as the marine mammal behavioural criteria for this assessment as it represents a conservative criterion as Southall et al. (2007) found that most marine mammals exhibited varying responses between 140 and 180 dB re 1 µPa.
- Peak pressure levels (PK) and frequency-weighted accumulated sound exposure levels (SEL24h) from Finneran et al. (Finneran, et al. 2017) for the onset of PTS and TTS in marine turtles.
- Marine turtle behavioural response threshold distance of 2 km from sound source as Popper et al. (2014) concluded that masking may occur at near, intermediate (hundreds of meters) and far (thousands of meters) distance, and behavioural at near and intermediate distances (Popper at al. 2014).
- Sound exposure guidelines for fish (including eels), fish eggs and larvae (Popper, et al. 2014).
- Current available literature on the sound exposure impacts to invertebrates for continuous noise is limited. Information is only available to define threshold levels for assessment for impulsive sources, as discussed in section 6.6.10. Studies have indicated that sub-lethal impacts may be expected (Day et al. 2020; Sole et al. 2023 – identified during consultation (Org ID: 578, AMOG Consulting, Event ID: 3893, FB ID: 418)), however these are expected to be negligible at an ecosystem or population level. Consequently, impacts to invertebrates have not been discussed further in this section, but are dealt with in section 6.7 (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 278, 280, 309, 338).
- There are no thresholds for underwater sound impacts to birds.

Recent Commonwealth guidance has defined injury to blue whales as both PTS and TTS hearing impairment, as well as any other form of physical harm arising from anthropogenic sources of underwater sound (DAWE 2021d).

See the JASCO sound modelling report (Appendix G) for further details on the exposure criteria (thresholds) modelled.

6.6.3.1. Modelling Results for T/49P

The maximum effect distances, from all modelled locations within the T/49P operational area, to PTS and TTS thresholds for marine mammals and turtles are presented in Table 6-19, and the effect distances for behavioural disturbance to marine mammals and fish are presented in Table 6-20.

Table 6-19: Marine fauna PTS and TTS sound criteria and predicted effect distances and areas

Hearing Group	SEL24h threshold ($L_{E,24h}$; dB re 1 µPa²·s)	Scenario 1: Prelay		Scenario 2: Mooring		Scenario 3: MODU		Scenario 4: MODU, Supply Vessel		Scenario 5: MODU, Standby Vessel		Scenario 6: MODU, Supply and Standby Vessels	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
PTS													
LF cetaceans	199	-	/	0.29	0.25	0.03	/	0.20	0.07	0.03	/	0.20	0.07
HF cetaceans	198	-	/	-	/	0.02	/	0.06	/	-	/	0.06	/
VHF cetaceans	173	-	/	0.12	0.05	0.19	0.10	0.21	0.13	0.19	0.1	0.25	0.13
Otariid seals	219	-	/	-	/	–	/	0.06	/	-	/	0.06	/
Marine turtles	220	-	/	-	/	–	/	0.06	/	-	/	0.06	/
TTS													
LF Cetaceans	179	0.07	0.69	3.11	22.2	0.42	0.40	1.68	7.38	0.41	1.08	1.79	7.93
HF cetaceans	178	-	/	0.09	0.03	0.10	0.03	0.14	0.05	0.09	0.03	0.16	0.05
VHF cetaceans	153	-	/	1.43	6.43	1.54	7.29	1.74	8.42	1.54	7.42	1.80	8.99
Otariid seals	199	-	/	0.08	0.02	0.02	/	0.10	0.01	-	/	0.10	0.01
Marine turtles	200	-	/	0.22	0.15	0.02	/	0.20	0.07	-	/	0.20	0.07

LF = low frequency, HF = high frequency, VHF = very high frequency cetaceans as described in Section 6.6.7.1.
A dash indicates the level was not reached within the limits of the modelled resolution (20 m).
A slash indicates that the area is less than an area associated with the modelled resolution (0.0013 km²).

Table 6-20: Marine fauna behavioural noise criteria and predicted effect distances

Hearing Group	SPL (L_p; dB re 1 µPa)	Scenario 1: Prelay		Scenario 2: Mooring		Scenario 3: MODU		Scenario 4: MODU, Supply Vessel		Scenario 5: MODU, Standby Vessel		Scenario 6: MODU, Supply and Standby Vessels	
		R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)
Fish (swim bladder)	170[a]	-	-	0.02	0.02	–	–	0.08	0.08	–	–	0.04	0.03
	158[b]	-	-	0.13	0.13	0.02	0.02	0.19	0.17	–	–	0.14	0.12
Marine Mammals	120[c]	0.50	0.47	11.8	10.6	1.48	1.25	12.0	10.9	2.32	2.09	12.0	10.9

[a] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).
[b] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).
[c] Threshold for marine mammal behavioural response to non-impulsive noise (NOAA 2019).
A dash indicates the threshold is not reached within the limits of the modelled resolution (20 m).

6.6.3.2. Modelling Results for Southern Extent of VIC/P79

The maximum effect distances, from all modelled on-shelf and a representative shelf-edge location within the southern extent of the VIC/P79 operational area, to PTS and TTS thresholds for marine mammals and turtles are presented in Table 6-21, and the effect distances for behavioural disturbance to marine mammals and fish are presented in Table 6-22.

Table 6-21: Marine fauna PTS and TTS sound criteria and predicted effect distances and areas

Hearing Group	SEL24h threshold ($L_{E,24h}$; dB re 1 µPa²·s)	Typical On-shelf Sites								Representative Shelf-edge Site			
		Scenario 1: Prelay		Scenario 2: Mooring		Scenario 5: MODU, Standby Vessel		Scenario 6: MODU, Supply and Standby Vessels		Scenario 1: Prelay		Scenario 5: MODU, Supply Vessel	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
PTS													
LF cetaceans	199	-	/	0.32	0.25	0.03	/	0.18	0.07	-	/	0.15	0.03
HF cetaceans	198	-	/	-	/	-	/	0.04	/	-	/	0.06	/
VHF cetaceans	173	-	/	0.12	0.04	0.19	0.09	0.21	0.12	0.13	0.06	0.16	0.07
Otariid seals	219	-	/	-	/	-	/	0.02	/	-	/	0.06	/
Marine turtles	220	-	/	-	/	-	/	0.06	/	-	/	0.06	/
TTS													
LF cetaceans	179	-	0.69	3.11	22.2	0.41	1.13	1.62	7.81	0.23	0.16	2.30	11.5
HF cetaceans	178	-	/	0.09	0.03	0.09	0.03	0.14	0.05	0.09	0.03	0.12	0.03
VHF cetaceans	153	-	/	1.44	6.42	2.98	7.42	2.96	8.95	1.51	7.10	1.66	7.95
Otariid seals	199	-	/	0.08	0.02	-	/	0.07	0.01	-	/	0.08	/
Marine turtles	200	-	/	0.23	0.16	-	/	0.14	0.07	-	/	0.13	0.02

LF = low frequency, HF = high frequency, VHF = very high frequency cetaceans as described in Section 6.6.7.1.
A dash indicates the level was not reached within the limits of the modelled resolution (20 m).
A slash indicates that the area is less than an area associated with the modelled resolution (0.0013 km²).

Table 6-22: Marine fauna behavioural sound criteria and predicted distances

Hearing Group	SPL (L_p; dB re 1 µPa)	Typical On-shelf Sites								Representative Shelf-edge Site			
		Scenario 1: Prelay		Scenario 2: Mooring		Scenario 5: MODU, Standby Vessel		Scenario 6: MODU, Supply and Standby Vessels		Scenario 1: MODU		Scenario 5: MODU, Supply Vessel	
		R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)
Fish (swim bladder)	170[a]	-	-	0.02	0.02	-	-	0.03	0.03	–	–	0.02	0.02
	158[b]	-	-	0.13	0.13	-	-	0.14	0.13	–	–	0.08	0. 08
Marine Mammals	120[c]	0.47	0.44	11.6	10.5	2.44	2.11	12.2	10.9	1.39	1.16	22.8	18.9

[a] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).
[b] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).

[c] Threshold for marine mammal behavioural response to non-impulsive noise (NOAA 2019).
A dash indicates the threshold is not reached within the limits of the modelled resolution (20 m).

6.6.3.3. Modelling Results for Northern Extent of VIC/P79

The maximum effect distances, from all modelled locations within the northern extent of the VIC/P79 operational area, to PTS and TTS thresholds for marine mammals and turtles are presented in Table 6-23, and the effect distances for behavioural disturbance to marine mammals and fish are presented in Table 6-24.

Table 6-23: Marine fauna PTS and TTS sound criteria and predicted effect distances and areas

Hearing Group	SEL24h threshold ($L_{E,24h}$; dB re 1 µPa²·s)	Scenario 1: Prelay		Scenario 2: Mooring		Scenario 5: MODU, Standby Vessel		Scenario 6: MODU, Supply and Standby Vessels	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
PTS									
LF cetaceans	199	-	/	0.30	0.26	0.02	/	0.20	0.10
HF cetaceans	198	-	/	-	/	-	/	0.04	/
VHF cetaceans	173	-	/	0.15	0.07	0.21	0.12	0.24	0.14
Otariid seals	219	-	/	-	/	-	/	0.02	/
Marine turtles	220	-	/	-	/	-	/	0.06	/
TTS									
LF cetaceans	179	-	0.69	3.59	29.8	0.46	1.23	1.93	7.98
HF cetaceans	178	-	/	0.12	0.04	0.12	0.04	0.15	0.06
VHF cetaceans	153	-	/	1.55	7.07	2.84	7.39	3.22	8.99
Otariid seals	199	-	/	0.08	0.02	-	/	0.07	0.01
Marine turtles	200	-	/	0.28	0.18	-	/	0.15	0.06

A dash indicates the level was not reached within the limits of the modelled resolution (20 m).
A slash indicates that the area is less than an area associated with the modelled resolution (0.0013 km²).

Table 6-24: Marine fauna behavioural sound criteria and predicted distances

Hearing Group	SPL (L_p; dB re 1 µPa)	Scenario 1: Prelay		Scenario 2: Mooring		Scenario 3: MODU, Standby Vessel		Scenario 4: MODU, Supply and Standby Vessels	
		R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)
Fish (swim bladder)	170[a]	-	-	0.02	0.02	-	-	0.02	0.02
	158[b]	-	-	0.13	0.13	-	-	0.13	0.13
Marine Mammals	120[c]	0.44	0.39	12.2	10.9	2.39	2.12	12.6	10.8

[a] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).
[b] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).
[c] Threshold for marine mammal behavioural response to non-impulsive noise (NOAA 2019).
A dash indicates the threshold is not reached within the limits of the modelled resolution (20 m).

6.6.3.4. Furthest modelled distances for Marine Fauna Sound Criteria

The maximum effect distances, from all modelled locations across both T/49P and VIC/P79 operational areas, to PTS and TTS thresholds for marine mammals and turtles are summarised in Table 6-25, and the effect distances for behavioural disturbance to marine mammals and fish are summarised in Table 6-26.

Table 6-25: Marine fauna PTS and TTS sound criteria and maximum modelled effect distances

Hearing Group	SEL24h threshold ($L_{E,24h}$; dB re 1 µPa²·s)	Maximum effect distance R_{max} (km)	Modelled scenario(s) where maximum effect distances to PTS and TTS thresholds are predicted
PTS			
LF cetaceans	199	0.32	VIC/P79-South: Scenario 2: Mooring
HF cetaceans	198	0.06	T/49P: Scenario 4: MODU + Supply Vessel and Scenario 6: MODU + Supply + Resupply Vessel
			VIC/P79-South: Scenario 2: MODU + Standby Vessel (Shelf Edge)
VHF cetaceans	173	0.25	T/49P: Scenario 6: MODU + Supply + Resupply Vessel
Otariid seals	219	0.06	T/49P: Scenario 4: MODU + Supply Vessel and Scenario 6: MODU + Supply + Resupply Vessel
			VIC/P79-South: Scenario 3: MODU + Standby Vessel (Shelf Edge)
Marine turtles	220	0.06	T/49P: Scenario 4: MODU + Supply Vessel and Scenario 6: MODU + Supply + Resupply Vessel
			VIC/P79- South: Scenario 3: MODU + Standby Vessel (Shelf Edge) and Scenario 4: MODU + Standby + Resupply Vessel
			VIC/P79- North: Scenario 4: MODU + Standby + Resupply Vessel
TTS			
LF Cetaceans	179	3.59	VIC/P79- North: Scenario 2: Mooring
HF cetaceans	178	0.16	T/49P: Scenario 6: MODU + Supply + Resupply Vessel
VHF cetaceans	153	3.22	VIC/P79- North: Scenario 4: MODU + Standby + Resupply Vessel
Otariid seals	199	0.10	T/49P: Scenario 4: MODU + Supply Vessel
Marine turtles	200	0.28	VIC/P79- North: Scenario 2: Mooring

Table 6-26: Marine fauna behavioural sound criteria and maximum modelled effect distance

Hearing Group	SPL (L_p; dB re 1 µPa)	Furthest modelled distance	Modelled scenario(s) where maximum effect distances to PTS and TTS thresholds are predicted
		R_{max} (km)	
Fish (swim bladder)	170[a]	0.08	T/49P: Scenario 4: MODU + Supply Vessel
	158[b]	0.19	T/49P: Scenario 4: MODU + Supply Vessel
Marine Mammals	120[c]	12.6 (Shelf)	VIC/P79- North: Scenario 4: MODU + Standby + Resupply Vessel
		22.8 (Shelf Edge)	VIC/P79- South: Scenario 4: MODU + Standby + Resupply Vessel

[a] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).
[b] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).
[c] Threshold for marine mammal behavioural response to non-impulsive noise (NOAA 2019).

6.6.4. Environmental Impacts

Underwater continuous sound emissions have the potential to result in and change in ambient sound.

A change in ambient sound has the potential to result in impacts to receptors, including:

- Change in fauna behaviour, including stress responses (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 37)
- Injury/mortality (barotrauma) to fauna, including:
    - Mortality, including injury leading to death
    - Auditory impairment
    - Permanent threshold shift (PTS), and
    - Temporary threshold shift (TTS)

It was acknowledged during consultation (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 36) that anthropogenic underwater noise is a pervasive yet relatively transient form of pollution.

6.6.5. Defining the Environment that May Be Affected (EMBA)

Certain groups of marine receptors have been identified to both perceive and be affected by sound in similar ways. Sound exposure threshold criteria have been developed to account for differing impact levels (e.g. different threshold criteria for PTS, TTS and behavioural disturbance), and for variability between groups (e.g. different threshold criteria for marine mammals and fish).

When defining the environment that may be affected (EMBA) by continuous sound emissions, EMBAs are identified and evaluated for each threshold criteria relevant to each receptor group. is dependent upon the receptor, due to the variation in sound exposure thresholds. However, some broad grouping can be made to enable effective characterisation of values and sensitivities within the different EMBAs. Throughout the consequence evaluation, modelling results are used to describe specific consequences to individual receptor groups within EMBAs.

Table 6-27 describes the basis for defining the EMBAs for continuous sound emissions, including relevant sources of information and the resultant spatial extent.

Table 6-27: Defining the EMBAs for continuous sound emissions

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
Continuous Sound Emissions	2 km EMBA for injury to fish and marine turtles	Maximum distance within which: - Recoverably injury and TTS may occur in fish, and - PTS and TTS may occur in marine turtles.	Underwater sound modelling (Appendix G	**2 km** around drilling activities (assessed as 2km around operational areas)
	3.59 km EMBA for injury to marine mammals	Maximum distance within which: - TTS in marine mammals may occur (based on results for low-frequency cetaceans).	Underwater sound modelling (Appendix G)	**3.59 km** around drilling activities (assessed as 3.59 km around operational areas)
	12.6 km EMBA for behavioural disturbance to marine mammals on-shelf	Maximum distance within which: - Behavioural disturbance to marine mammals may occur during resupply of MODU at on-shelf locations.	Underwater sound modelling (Appendix G)	**12.6 km** around drilling activities (assessed as 12.6 km around operational areas)

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
	22. 8 km EMBA for behavioural disturbance to marine mammals on shelf-edge	Maximum distance in the offshore direction, within which: - Behavioural disturbance to marine mammals may occur during resupply of MODU at shelf-edge locations.	Underwater sound modelling (Appendix G)	**22.8 km** around drilling activities (assessed as 22.8 km in the offshore direction around operational areas)

6.6.6. Identifying Sound-sensitive Receptors

ConocoPhillips Australia considers the values and sensitivities relevant to the assessment of impacts associated with underwater sound, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

Continuous underwater sound emissions may impact the following biological receptors:

- Fish (with and without swim bladders) including eels, sharks and rays
- Marine turtles
- Birds, and
- Marine mammals (e.g. pinnipeds and cetaceans)

For fish, the EPBC Act PMST Report for the largest effect distance (Appendix B) identified 37 species which may occur within the 2 km EMBA for injury to fish (conservatively assessed as 2 km around the operational areas). Of these, 7 species have an EPBC threatened status, with 2 listed as Vulnerable (white shark (*Carcharodon carcharias*) and Australian grayling (*Prototroctes maraena*)), and 5 listed as Conservation Dependent (blue warehou (*Seriolella brama*), southern bluefin tuna (*Thunnus maccoyii*), deep-orange roughy (*Hoplostethus atlanticus*), southern dogfish (*Centrophorus zeehaani*), and eastern school shark (*Galeorhinus galeus*)).

For marine turtles, the EPBC Act PMST Report for the largest effect distance (Appendix B) identified 3 species which may occur within the 2 km EMBA for injury to marine turtles (conservatively assessed as 2 km around the operational areas). All species have EPBC threatened status', with 2 listed as Endangered (loggerhead (*Caretta caretta*) and leatherback (*Dermochelys coriacea*)) and one listed as Vulnerable (green (*Chelonia mydas*)).

For marine mammals, the EPBC Act PMST Report for the largest effect distance (Appendix B) identified 32 species which may occur within the 12.6 km EMBA for behavioural disturbance to marine mammals (conservatively assessed as 12.6 km around the operational areas) Sound Behaviour EMBA (12.6 km). Of these, five low frequency cetacean species have EPBC threatened status, including three listed as Endangered (southern right whale (*Eubalaena australis*), blue whale (*Balaenoptera musculus*), and the Australia Sea-lion (*Neophoca cinerea*)), and two as Vulnerable (sei whale (*Balaenoptera borealis*), and (fin whale (*Balaenoptera physalus*)). Additionally, two low frequency cetacean species (humpback whale and pygmy right whale) are known to or may (respectively) migrate through the area. These species are not listed as threatened, although the pygmy right whale may be undertaking foraging in the area. Three listed migratory high frequency cetacean species (sperm whale, orca and dusky dolphin) were also identified as may or likely to occur in area. These species are not listed as threatened and are not identified to be undertaking biologically important behaviours in the area.

The EPBC Act PMST Report for the largest threshold distance identified for marine mammals from the shelf edge site (Appendix B Sound Behaviour EMBA 22.8 km) identified 29 marine mammals which may occur within the Sound Behaviour EMBA (22.8 km). All species identified within the EPBC Act PMST Report for the Sound Behaviour EMBA 12.6 km were found within the Sound Behaviour 22.8 km.

During consultation relevant persons requested that the impact of acoustic disturbance be considered to species including:

- cetacean species with important migration, foraging and/or breeding habitats including pygmy blue whales, southern right whales, humpback whales and dwarf minke whales (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41-43); and
- the shy albatross, and to breeding colonies of short-tailed shearwaters and little penguins present on the west coast of King Island, such as the avoidance of key foraging habitats during the breeding season (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 53; Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 2690, FB ID: 155).

Consequently, bird species that may be affected by an increase in ambient underwater sound from exploration activities and have also been evaluated despite the lack of threshold data.

Additionally, relevant persons requested information regarding impacts of sound to invertebrates, which have been addressed in Section 6.7 (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 278, 280, 309, 338).

Conservation values and sensitivities such as marine protected reserves, socio-economic receptors such as commercial fisheries, and the cultural environment have values that may be affected by an increase in ambient underwater sound from exploration activities and have also been evaluated.

6.6.7. Consequence Evaluation

6.6.7.1. Ecological Receptors

Fish

For fish (with and without swim bladders) including eels, sharks and rays the 48-hour recoverable injury criteria was reached within 80 m during a resupply of the MODU. Resupply activities typically take on average 3 hours and are not anticipated to occur for 48-hours. No habitats likely to support site-attached fish have been identified in the operational areas. Therefore, it is unlikely that fish species would be present within 80 m of the resupply operation for 3 hours, let alone a period of 48 hours. Consequently, recoverable injury impacts are not predicted. [Paragraph updated in response to Matter: F10].

The 12-hour TTS criteria for fish was reached within 190 m during a resupply of the MODU. Resupply activities typically take on average 3 hours and are not expected to take 12 hours. No habitats likely to support site-attached fish have been identified in the operational areas. Therefore, it is unlikely that fish species would be present within 190 m of the resupply operation for a period of 3 hours, let alone 12 hours. Consequently, TTS impacts are not predicted.

Behavioural impacts, such as avoidance behaviour of continuous sound sources, are more likely to occur (Popper et al. 2014). All EPBC PMST listed fish species including sharks are highly mobile and are expected to have a largely transitory presence in the operational areas. These species are expected to move away from sound sources without restriction, thus further reducing the likelihood of experiencing injury or TTS.

A study conducted on anguilliform fish, such as eels, under experimental conditions found that the introduction of acoustic stimuli influenced the behaviour (i.e. increased swimming speeds, movements away from ensonified walls) of the river lamprey (*Lampetra fluviatilis*) and the European eel (Anguilla) but did not influence route selection and therefore didn't influence movements of either species (Deleau et al. 2019). It was stated that the observed responses would likely be insufficient to induce a strong deterrent effect in the field if used in isolation (Deleau et al. 2019). [Paragraph added in response to Matter: F10].

The operational area is within a distribution BIA for the white shark, though no habitat critical to the survival of the species or behaviours were identified. The Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a) does not identify sound as a threat.

The consequence severity of continuous underwater sound on fish, including eels, sharks and rays, is assessed as **Minor (2)** based on:

- No habitats likely to support site-attached fish were identified within the operational areas and, therefore the presence of site-attached fish, to experience recoverable injury or TTS, is considered unlikely.
- The majority of fish species are expected to exhibit avoidance behaviours to sound emissions (Popper et al. 2014).
- Sound impacts are not identified as a threat within the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a), listed as Vulnerable under the EPBC Act.
- Sound impacts are not identified as a threat within either the National Recovery Plan for the Australian Grayling (*Prototroctes maraena*) (DSE 2008) or the Conservation Advice for the Australian Grayling (*Prototroctes maraena*) (TSSC 2021b), listed as vulnerable under the EPBC Act.

Marine Turtles

The Recovery Plan for Marine Turtles in Australia (CoA 2017) identifies sound interference as a threat to turtles, citing that exposure to chronic (continuous) loud sound in the marine environment may lead to avoidance of important habitat. The EPBC Act PMST Report (Appendix B) identified three species which may occur within the EMBA for injury (2 km), though no BIAs or habitat critical to the survival of the species were identified. Consequently, marine turtles are expected to be transient in the operational area.

The 24 hr PTS criteria was reached within 60 m during a resupply of the MODU. Typical resupply takes on average 3 hours, with resupply for 24 hours unlikely. Thus, PTS impacts are not predicted.

The 24 hr TTS criteria was reached within 280 m of MODU mooring operations. As mooring operations are expected to take approximately 24-36 hours, it is possible for TTS impacts to occur. However, it is unlikely that individual marine turtles will remain within 280 m of mooring operations for 24 hours and, consequently, TTS impacts are considered unlikely. Data on behavioural responses, such as avoidance or masking, of marine turtles to sound emissions does not exist (Popper et al. 2014).

The consequence severity of continuous underwater sound on marine turtles is assessed as **Minor (2)** based on:

- The Recovery Plan for Marine Turtles in Australia (CoA 2017) details that exposure to chronic (continuous) loud sound in the marine environment may lead to avoidance of important habitat. However, no biologically important behaviours, BIAs or habitat critical to survival for marine turtles were identified within the EMBA for injury (2 km).

- Marine turtle PTS and TTS thresholds identified by Finneran et al. (2017) are predicted to be reached. However, it is unlikely for marine turtles to remain within 60-280m of mooring activities for the duration required to experience PTS and TTS (24 hours).
- The numbers of turtles expected to occur within the operational areas is low, therefore, any potential impacts are not anticipated to impact population levels.

Birds

Continuous underwater sound emissions have the potential to result in a change in ambient sound. As a result of a change in ambient sound, further impacts may occur to birds, including a change in behaviour, hearing capacity and physical condition. There are no thresholds for underwater sound impacts to birds. As such, no modelling can be conducted. The threshold for physiological damage on the auditory system for birds is unknown.

Most seabirds, such as the shy albatross, are generally shallow divers and utilise surface waters where the acoustic signals ‘destructively interfere’ with the sea surface, resulting in much lower sound exposure compared with deeper waters (Marine Technology Directorate, 1996: cited in SCAR, 2002) and the time of exposure underwater is short. If individual birds or flocks are present in the area during activities, vessel movement is expected to temporarily deter them from foraging in the immediate vicinity of the vessel or drilling rig. The uncertainty of underwater sound impacting individuals or a population of any given species during plunge/dive feeding is extremely low. While resting/rafting on the water surface, there is limited potential for seabirds to be affected by the underwater sound due to the limited transmission of sound between the air-water interface. If there is an effect, it is likely to be a startle response, resulting in the bird flying away.

Seabirds feed on multiple prey species and have widespread foraging areas. Indirect impacts including displacement of prey species such as fish as a result of continuous underwater sound emissions will be limited to the close proximity of the MODU or vessels (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 52). The maximum 12-hour TTS criteria for fish was reached within 190 m during a resupply of the MODU. While displacement of some prey species may result in the displacement of these birds, this impact is localised, temporary and recoverable in any one location. Given their widespread foraging areas (ACAP 2018) and the small area possibly affected by prey displacement, seabirds are not expected to be impacted by reduced net foraging opportunities. Impacts to shorebird species are not predicted from the activity, given their prey is concentrated within the intertidal zone along the coastline which will not be impacted by continuous underwater sound emissions.

The little penguin is capable of diving to 72 m but typically dives to 10-20 m. During the non-breeding season this species is known to participate in single-day or multiple-day foraging trips, primarily in coastal waters. A study conducted by McCutcheon et al. found approximately 3/4 of individuals partaking in single-day trips where foraging occurred between 8-14 km from the colony, while the remaining quarter underwent multiple day trips to maximum distance of 62-147 km from the colony (2011). During the breeding season (October to December) this species is expected to remain closer, within 15 km, to their colonies (Australian Wildlife, 2014). The little penguin has a foraging BIA (10 km buffer) around Christmas Island (off the north-east coast of King Island), which is a breeding colony. The Operational Area for T/49P is more than 20 km from the little penguin BIA. On this basis, encounter rates with little penguin within Operational Areas is expected to be low. It is inferred that penguins have relatively poor hearing thresholds in the lower frequencies (McCauley, 1994). As little penguins typically participate in coastal foraging trips within 8-14 km of their colonies (McCutcheon et al. 2011) and considering colonies are located approximately 20 km or more from the operational areas impacts to the little penguin from continuous underwater sound emissions are not predicted (Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 2690, FB ID: 143, 155; Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 3860; FB ID: 154).

The consequence is assessed as **Negligible (1)** as there are no identified noise thresholds identified for birds, and any changes in prey availability will be localised, temporary and recoverable.

Otariid Seals

For Otariids, the maximum effect distances to the PTS and TTS criteria are 60 m and 100 m, respectively. Effect distances to behavioural disturbance thresholds ranged from 500 m during pre-lay operations to 12.6 km during vessel standby and resupply at the MODU whilst under DP. The maximum behavioural disturbance effect distance during vessel standby and resupply of the MODU at shelf-edge locations is 22.8 km in the offshore direction. The PMST Report for the largest effect distance (Appendix B), based on the 22.8 km EMBA for behavioural disturbance in the offshore direction at shelf-edge locations, identified that the Australian fur seal (*Arctocephalus pusillus*), the New Zealand fur seal (*Arctocephalus forsteri*), and the Australia Sea-lion (EPBC Act listed as Endangered) may occur in the area. No biologically important areas or behaviours were identified within this EMBA, based on the PMST Report, however breeding colonies for Australian fur seal and New Zealand fur seal are known to occur along the Victorian coastline and west side of King Island.

During consultation, the environmental values and sensitivities of Deen Maar (Lady Julia Percy Island, Victoria), were identified including the presence of breeding colonies of Australian and New Zealand fur-seals (Org ID: 597, Event ID: 1144, FB ID: 32, 33). Seals are mainly seen to inhabit the southern and eastern coastlines of Lady Julia Percy Island, with the area listed as pupping / mating / moulting and haul-out (Kirkwood et al. 2010). Arnould and Hindell (2001) found that to successfully rear a pup, adult female Australian fur seals must forage out of a central place for 11 months each year and are accordingly, more restricted in range than other demographic components. Arnould & Kirkwood 2008 found that lactating female seals tend to forage in the mid- outer continental shelf/ shelf waters at depths of <200 m and therefore may forage within the operational areas. Deen Maar is located approximately 17 km from the closest point of the VIC/P79 operational area and is outside of the sound EMBA for behavioural effect distance for marine mammals, including pinnipeds, of 12.6 km for on-shelf locations. Further, Reid Rocks is located approximately 52 km from the closets point of the T/49P operational area and is outside of the sound EMBA for behavioural effect distance for marine mammals, including pinnipeds, of 22.8 km for off-shelf locations. [Paragraph updated in response to Matter: M27].

The Conservation Advice for the Australian Sea-lion *Neophoca cinerea* (TSSC 2020c) lists noise emissions as a ‘potential’ threat.

The consequence is assessed as **Minor (2)** for otariid seals, based on:

- The Conservation Advice for the Australian Sea-lion *Neophoca cinerea* (TSSC 2020c) lists noise emissions as a ‘potential’ threat to the Australia Sea-lion. However, no biologically important behaviours or BIAs were identified within the largest effect distance (Appendix B), based on the EPBC PMST search.
- Otariid seal PTS and TTS thresholds are predicted to be reached; however, it is unlikely for these species to remain within 60-100 m of mooring activities for the duration required to experience PTS and TTS (24 hours).
- Deen Maar (Lady Julia Percy Island, Victoria), where breeding colonies of Australian and New Zealand fur-seal occur, is outside of the sound EMBA for behavioural disturbance.

Very High-frequency Cetaceans

The maximum distances to the very high-frequency (VHF) cetacean PTS and TTS criteria are 250 m and 3.22 km, respectively. The PMST Report for the largest conservative effect distance of 3.59 km (Appendix B) based on TTS criteria for low-frequency cetaceans, identified that VHF cetaceans such as pygmy sperm whale (*Kogia breviceps*) and dwarf sperm whale (*Kogia sima*) may occur within the EMBA for TTS (3.59 km). However, no biologically important areas or behaviours were identified.

The behavioural disturbance effect distances ranged from 500 m during pre-lay operations to 12.6 km during vessel standby and resupply of the MODU. The maximum behavioural disturbance effect distance during vessel standby and resupply of the MODU at shelf-edge locations is 22.8 km in the offshore direction. The PMST Report for the largest effect distance (Appendix B) based on the 22.8 km EMBA for behavioural disturbance in the offshore direction at shelf-edge locations, identified the same VHF cetaceans as the 3.59 km TTS EMBA.

Behavioural impacts to VHF cetaceans are predicted to be temporary avoidance ranging from 500 m during pre-lay operations, to 12.6 km during standby and resupply, and up to 22.8 km during standby and resupply in the offshore direction at shelf-edge locations. These activities occur periodically and are of short duration.

The consequence is assessed as **Negligible (1)** as there are no biologically important behaviours or biologically important areas identified for VHF cetaceans within the EMBAs.

High-Frequency Cetaceans

The maximum distances to the high-frequency (HF) cetacean PTS and TTS criteria are 60 m and 160 m, respectively. The PMST Report for the largest conservative effect distance of 3.59 km (Appendix B) based on TTS criteria for low-frequency cetaceans, three listed migratory species (sperm whale, orca and dusky dolphin) may occur within the EMBA for TTS (3.59 km). No HF cetacean species listed as threatened, and no biologically important areas or behaviours were identified. The PTS and TTS criteria are for 24-hour cumulative SEL. It is unlikely that a HF cetacean would be within 60 to 160 m of the MODU for up to 24 hrs and thus PTS or TTS to HF cetaceans is not predicted.

The behavioural disturbance effect distances ranged from 500 m during pre-lay operations to 12.6 km during vessel standby and resupply of MODU whilst under DP for on-shelf locations. The maximum behavioural disturbance effect distance during vessel standby and resupply of the MODU at shelf-edge locations is 22.8 km in the offshore direction. The PMST Report for the largest effect distance (Appendix B) based on the 22.8 km EMBA for behavioural disturbance in the offshore direction at shelf-edge locations, identified the same HF cetaceans as the 12.6 km behavioural disturbance and 3.59 km TTS EMBAs.

Behavioural impacts to HF cetaceans are predicted to be temporary avoidance ranging from 500 m during pre-lay operations, to 12.6 km during standby and resupply, and up to 22.8 km during standby and resupply in the offshore direction at shelf-edge locations. These activities occur periodically and are of short duration.

The consequence is assessed as **Negligible (1)** as there are no biologically important behaviours or biologically important areas identified within the EMBAs.

Low-Frequency Cetaceans

The maximum effect distances to the low frequency (LF) cetacean PTS and TTS criteria are 320 m and 3.59 km, respectively. The PMST Report for the largest conservative effect distance of 3.59 km (Appendix B) identified several LF cetaceans which may occur within EMBA for TTS.

The behavioural disturbance effect distances ranged from 500 m during pre-lay operations to 12.6 km during vessel standby and resupply of the MODU at on-shelf locations. The maximum behavioural disturbance effect distance during vessel standby and resupply of the MODU at shelf-edge locations is 22.8 km in the offshore direction. The PMST Report for the largest effect distance (Appendix B) based on the 22.8 km EMBA for behavioural disturbance in the offshore direction at shelf-edge locations, identified the same LF cetaceans as the 12.6 km behavioural disturbance and 3.59 km TTS EMBAs.

Table 6-28 lists the LF cetaceans that have biologically important areas or biologically important behaviours within the EMBA for behavioural disturbance (22.8 km) and / or the EMBA for TTS (3.59 km).

Table 6-28: Low frequency cetaceans with biologically important behaviours within the PTS, TTS and Behaviour ensonification area

Species	EPBC Act	Biologically Important Behaviour
Blue whale (*Balaenoptera musculus*)	Endangered; Migratory	Foraging, feeding or related behaviour known to occur within area.
		High density foraging BIA.
Southern right whale (*Eubalaena australis*)	Endangered; Migratory	Migration.
Fin whale (*Balaenoptera physalus*)	Vulnerable; Migratory	Foraging, feeding or related behaviour likely to occur within area.
		No BIAs.
Sei whale (*Balaenoptera borealis*)	Vulnerable; Migratory	Foraging, feeding or related behaviour likely to occur within area.
		No BIAs.
Pygmy right whale (*Caperea marginata*)	Migratory	Foraging, feeding or related behaviour may occur within area.
		No BIAs

During consultation, feedback was provided on the process for evaluating activity limitations relevant to environmentally sensitive periods for cetaceans (Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 373, Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 377, 396; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 365; Org ID: 7, Director of National Parks (DNP), Event ID: 2470, FB ID: 243). If an offshore project or activity creates noise above relevant published injury and/or behavioural disturbance impact criteria inside a Foraging Area, NOPSEMA advises that titleholders should firstly evaluate all feasible measures to avoid times of the year when blue whales are likely to be foraging.

ConocoPhillips Australia has determined that the risk to all listed marine fauna cannot be avoided due to variability in timing of environmentally sensitive periods and unpredictable presence of some species, with blue whales typically present in foraging areas in higher numbers between November and May, and southern right whale typically present in Australian waters from early April to early November. Therefore, there is no period where avoidance of both species is possible. This assessment also applies to avoidance of environmentally sensitive periods relevant to mitigating vessel collision, assessed in section 7.4.

If it is not possible to avoid times sensitive times of year, there are requirements of the EPBC Act and the NOPSEMA EPBC Act-endorsed Program that constrain decision makers to ‘not act inconsistently’ with EPBC Act instruments, such as a recovery plan (e.g. the Conservation Management Plan for Blue Whales (CMP)). Accordingly, in order to demonstrate, with a high level of confidence, that requirements of the CMP will be met, approvals documentation needs to include content such as:

- well-founded Environmental Impact Assessment

- commitment(s) to implement whale detection that will be effective in detecting whales over the extent and duration of predicted impacts, including provision for detection measures to be scalable based on triggers such as activity timing and location, and whale sighting data; and
- associated management measures that are likely to be effective at preventing unacceptable impacts over the extent and duration scales informed by impact predictions and whale detection data gathered during the activity.

Consequently, ConocoPhillips Australia has undertaken to assess impacts to these species from the exploration drilling program and has made commitments to implement a Fauna Management Plan (Appendix N) that includes whale detection and measures to minimise anthropogenic threats to whales, with a particular focus on mitigating anthropogenic sound impacts to blue whales and southern right whales, given the activity overlaps relevant BIAs, and whales exhibiting biologically important behaviours.

This aligns with feedback provided during consultation that, while in general the preference is for seabed survey and drilling activities to take place outside of the main whale migration season (as this is the most effective way to mitigate potential impacts), there is a diversity of cetacean species using the area and, therefore, it is difficult to identify a time period with minimum impact (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 38).

Blue whales

The foraging BIA (annual high use) for blue whale (EPBC Act: Endangered; listed Migratory) has been identified within the area where the PTS, TTS and behavioural effect criteria are reached (see Figure 6-26). As detailed in EP Section 4.6.9.2, blue whale foraging occurs within Australian waters, such as the Bonney Upwelling system and adjacent waters off South Australia and Victoria and the Perth Canyon off Western Australia, typically from January to April, though whales maybe present from November to June. Offshore activities have overlapped this timing within this region for decades as it provides the most suitable weather to undertake offshore activities. Exploration activities may overlap this timing, and hence blue whales may be present within the area where the PTS, TTS and behavioural disturbance effect criteria are reached.

The Conservation Management Plan for the Blue Whale (DoE 2015) identifies anthropogenic noise interference as a threat and states that anthropogenic noise in BIAs must be managed so that blue whales can continue to utilise the area without 'injury and [are] not displaced from a foraging area'.

DAWE (2021a) defines 'displaced from a foraging area' as: 'The recovery plan requirement, Action A.2.3, applies in relation to BIAs. A whale could be displaced from a Foraging Area if impact mitigation is not implemented. This means that underwater anthropogenic noise should not:

- Stop or prevent any blue whale from foraging
- Cause any blue whale to move on when foraging, or
- Stop or prevent any blue whale from entering a foraging area.

It is considered that a whale is displaced from a foraging area if foraging behaviour is disrupted, regardless of whether the whale can continue to forage elsewhere within that foraging area. Mitigation measures must be implemented to reduce the risk of displacement occurring during operations where modelling indicates that behavioural disturbance within a foraging area may occur'.

DAWE (2021a) defines 'injury to blue whales' as: 'For the purpose of interpreting and applying Action Area A.2 of the Blue Whale CMP, injury is both permanent and temporary hearing impairment (Permanent Threshold Shift and Temporary Threshold Shift) and any other form of physical harm arising from anthropogenic sources of underwater noise'.

The sound EMBAs overlap an area of high productivity and seasonal upwelling. It is understood that this region acts as an important and consistently used PBW foraging area. PBW are expected to be observed in higher numbers during the November-May period, which defines the upwelling season and post-welling enrichment of the region. Sightings of PBW in the region between June-October do occur but are rare. No changes in prey availability are predicted based on the low risk of near, intermediate or far-ranging effects to fish eggs and larvae associated with non-impulsive noise (Popper et al. 2014).

Despite shipping and industry being present offshore of southeast Australia (and within blue whale BIAs) for decades, estimates indicate that blue whale populations are recovering (e.g. Branch et al. 2007; Balcazar et al. 2015, McCauley et al. 2018), albeit at a slower rate compared to other species such as the humpback whale (Noad et al. 2019; TSSC 2022).

The consequence severity of continuous underwater sound on blue whales is assessed as **Moderate (3)** based on the conservative approach taken to modelling, the use of maximum effect distances to PTS, TTS and behavioural disturbance, and the following information specific to the assessment of injury and behavioural disturbance. In addition, no changes in prey availability are predicted based on the low risk of near, intermediate or far-ranging effects to fish eggs and larvae associated with non-impulsive noise (Popper et al. 2014).

Regarding injury

The CMP for the Blue Whale (DoE 2015) assesses the impacts of shipping and industrial noise, which includes drilling, on the species as ‘Minor’ i.e., ‘individuals are affected but no affect at population level’. Estimates have indicated that blue whale populations within southeast Australia are continuing to recover despite shipping and industry activities being present (Branch et al. 2007; Balcazar et al. 2015, McCauley et al. 2018). Further, the Conservation Management Plan states that “It is the high intensity signals with high peak pressures received at very short range that can cause acute impacts such as injury and death.” Vessel and MODU sound considered within this section are continuous sound sources with no high intensity signals, as such it is unlikely that they would cause injury to foraging blue whales.

Although exploration activities overlap the foraging BIAs and may occur during the period when pygmy blue whales are likely to be foraging within the BIA, the largest area of potential TTS impact within the blue whale high annual use foraging BIA (which is 35,627 km^2) at any one time is very small. Thus, TTS impacts are considered unlikely, with impacted areas representing only very small portions of the foraging BIA as shown as a percentage of the BIA area below:

- Mooring operations result in a TTS effect area of 29.8 km^2 based on the TTS effect area associated with the maximum effect distance of 3.59 km shown in Table 6-23. This represents approximately 0.084% of the BIA, and only occurs for short (24-36 hour) periods during mooring operations at each well.
- Drilling operations result in a TTS effect area of 0.40 km^2 based on the TTS effect area associated with the maximum effect distance of 0.42 km shown in Table 6-19. This represents approximately 0.001% of the BIA, during continuous drilling operations for typically 30-40 days, but up to a maximum of 90 days, per well.
- Resupply operations result in a TTS effect area of 7.98 km^2 based on the TTS effect area associated with the maximum effect distance of 1.93 km shown in Table 6-23. This represents approximately 0.022% of the BIA, and only occurs for 3 hours a day on average during resupply operations with a vessel on standby.
- All vessels will adhere to the distances and vessel management practices of EPBC Regulation (Part 8) and will implement an increased caution zone of 500 m between whales and vessels.

Additionally, vessels conducting geotechnical sampling under DP will implement mitigation measures including pre-start surveys and shut-down procedures for blue whales.

Further, it is considered unlikely that an individual blue whale will remain within the area of impact over a continuous 24 hr period, as foraging blue whales will likely be actively foraging and searching for food, and not remaining stationary. Studies have shown that individuals can move at mean speeds of 2.8 km/hr +/- 2.2 km/hr whilst migrating and foraging (Owen, Jenner & Jenner 2016). Taking this into consideration, an individual will likely swim through the TTS effect range prior to the onset of injury.

Regarding behavioural disturbance

Blue whale foraging ranges are expansive (Möller et al. 2020), extending throughout Otway shelf waters. However, foraging behaviours are dependent upon availability of food sources (e.g. patches of krill), which are not uniformly distributed. The closest known feeding aggregation area, the Bonney Coast Upwelling KEF, is overlapped slightly by the largest typical threshold distance (12.6 km EMBA for behavioural disturbance on-shelf). Aerial surveys conducted over VIC/P79 and T/49P (Cetacean Surveillance Program Report – Appendix P) have found seasonally variable numbers of blue whales, peaking in March and April associated with krill swarms, which generally aligns with historical datasets (i.e., the Blue Whale Study) (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 49). Consequently, seasonally variable numbers of foraging blue whales are expected to occur within the operational area and specific PTS/TTS, and behaviour EMBAs. F

Although exploration activities overlap the foraging BIAs, and may occur during the period when pygmy blue whales are expected to be foraging within the BIA:

- The largest on-shelf area of behavioural disturbance, based on the maximum effect distance of 12.6 km during resupply, is 498.8 km^2 which is approximately 1.4% of the pygmy blue whale high annual use foraging BIA (35,627 km^2). Behavioural impacts from this activity would be short-term (3 hours on average per day) and will be mitigated through the Fauna Management Plan (Appendix N), detailed in Section 6.6.8. Consequently, the activity is not predicted to result in restriction in foraging or to result in population level impacts (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 43).
- The largest shelf-edge area of behavioural disturbance, based on the maximum behavioural effect distance of 22.8 km along the self-edge and 12.6 km on the shelf during resupply, is 1,160 km^2, which is approximately 3.26% of the pygmy blue whale high annual use foraging BIA (35,627 km^2). Any behavioural impacts from this activity would be short-term, i.e. for the duration of resupply only, and will be mitigated through the Fauna Management Plan (Appendix N), detailed in Section 6.6.8. Consequently, the activity is not predicted to result in a restriction in foraging or in population level impacts (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41, 46).

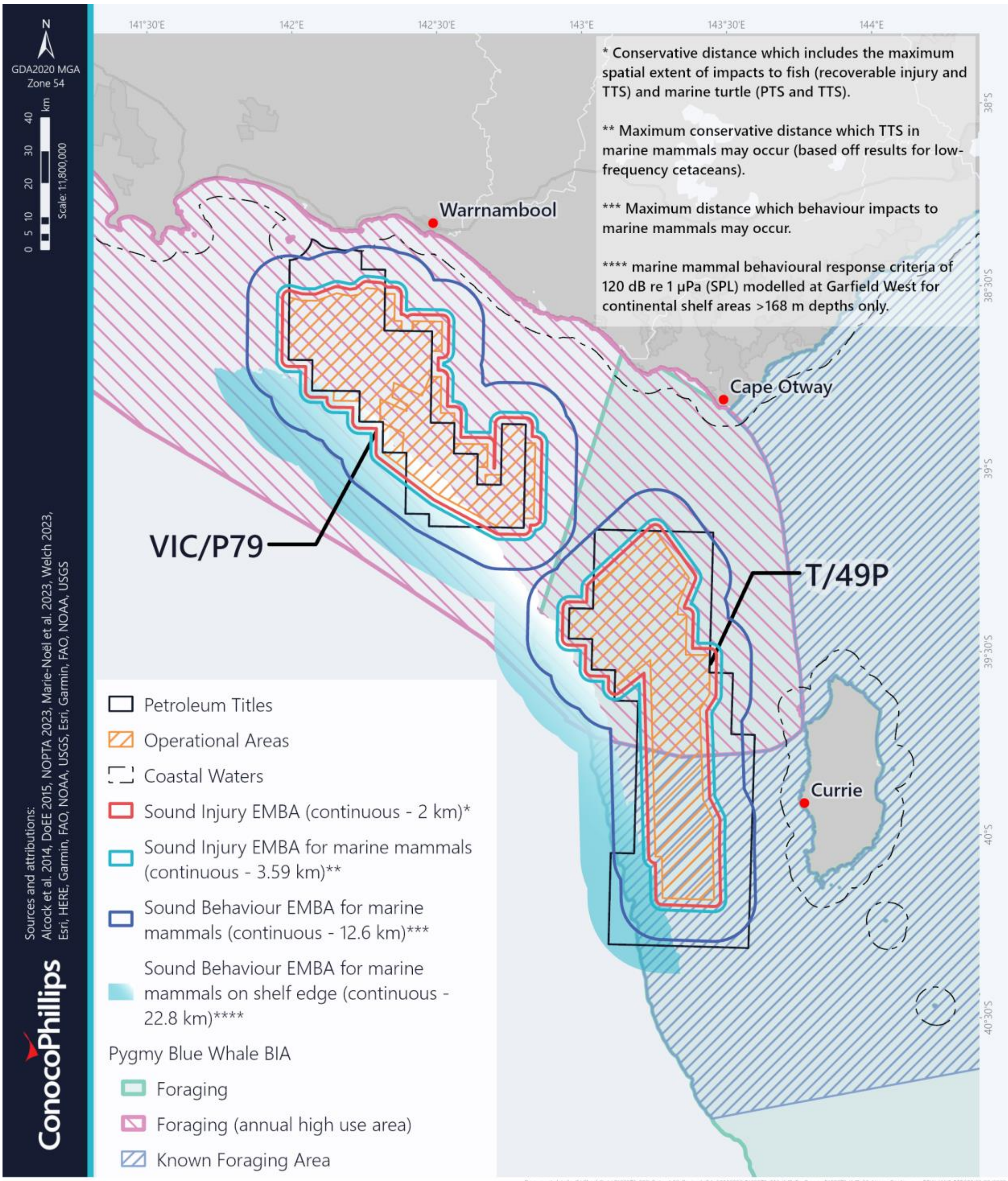


Figure 6-26: Blue whale BIAs and sound EMBA

Southern right whales

During consultation, the Bass Strait was identified as a migratory route for the southern right whale (*Lissodelphis peronii*) (EPBC Act: Endangered; listed Migratory) (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41, 44). Whilst under the Tasmanian Threatened Species Protection Act 1995 the southern right whale is listed as Endangered there is no state conservation management plan detailing threats to the species. The NRE Tasmania Conservation site (NRE Tasmania 2023) refers to the Commonwealth Conservation Management Plan (CMP) for the Southern Right Whale (CoA 2012).

The CMP identifies shipping and industrial sound, which includes drilling activities, as a threat. This threat is classed as a minor consequence, which is defined as individuals are affected but no affect at a population level. The CMP also states that the behavioural impacts of sound on southern right whales are largely unknown and, therefore, a precautionary approach has been applied regarding assignation of possible consequence.

The CMP identifies that this species moves through the known core range to reach the migration and resting on migration BIA, which is an area of shallow and more sheltered waters adjacent coastlines (DSEWPaC 2012b). Aggregation for breeding and calving has previously been identified to occur within an aggregation BIA off Warrnambool, Victoria (DSEWPaC 2012b). However, recent spatial data now supersedes this information (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467). The National Conservation Values Atlas (2023) spatially defines migration and reproduction BIAs for this species within Australian waters, and it has been identified that:

- The reproduction BIA is not overlapped by the continuous sound EMBAs, however
- There is an overlap between the migration BIA where PTS, TTS or behavioural disturbance criteria are reached (Figure 6-27).

As detailed in EP Section 4.6.9.2 southern right whales are typically present in Australian waters from April to October, with isolated individuals seen outside this period.

The consequence severity of continuous underwater sound on southern right whales is assessed as **Moderate (3)** based on the conservative approach taken to modelling, the use of maximum effect distances to PTS, TTS and behavioural disturbance, and the following information specific to the assessment of injury and behavioural disturbance.

Regarding injury

The CMP for the Southern Right Whale (DSEWPaC 2012b) assesses the impacts of acute industrial noise, which includes impulsive noise, as a ‘Minor’ i.e. ‘individuals are affected but no affect at population level’.

Although exploration activities overlap the migration BIA, and may occur during the period when southern right whales could be migrating through the BIA, the largest area of potential TTS impact within this area is very small. Thus, TTS impacts are considered unlikely, with impacted areas representing only very small portions of the migration BIA (shown as a percentage of the BIA area below):

- Mooring operations result in a TTS effect area of 29.8 km^2 based on the TTS effect area associated with the maximum effect distance of 3.59 km shown in Table 6-23. This represents approximately 0.001 % of the migration BIA, and only occurs for short (24-36 hour) periods during mooring operations at each well.
- Drilling operations result in a TTS effect area of 0.40 km^2 based on the TTS effect area associated with the maximum effect distance of 0.42 km shown in Table 6-19. This represents considerably less than 0.001% of the BIA, during continuous drilling operations for typically 30-40 days, but up to a maximum of 90 days, per well.
- Resupply operations result in a TTS effect area of 7.98 km^2 based on the TTS effect area associated with the maximum effect distance of 1.93 km shown in Table 6-23. This represents less than 0.001 % of the migration BIA, and only occurs for 3 hours a day on average during resupply operations with a vessel on standby.
- All vessels will adhere to the distances and vessel management practices of EPBC Regulation (Part 8) and will implement an increased caution zone of 500 m between whales and vessels.

Additionally, vessels conducting geotechnical sampling under DP will implement mitigation measures including pre-start surveys and shut-down procedures for southern right whales.

Further, PTS and TTS values assume the animal remains within the effect distance for 24 hours. Southern right whales are mobile species and are expected to be migrating through the area to reach coastal habitat or return to southern foraging grounds. Studies report swim speeds for the southern right whale of between 3 – 3.3 km / hr (Mate *et al*. 2011; Mackay *et al*. 2015 cited in Charlton 2017). Therefore, it is highly unlikely an animal would be exposed within these ranges over a continuous 24 hr period to experience the onset of PTS or TTS.

Regarding behavioural disturbance

Although exploration activities overlap the migration BIA and may occur during the period when southern right whales could be migrating through the BIA:

- The largest on-shelf area of behavioural disturbance, based on the maximum behavioural effect distance of 12.6 km during resupply, is 498.8 km^2, which is 0.02% of the southern right whale migration BIA (2,441,611 km^2). Behavioural impacts from this activity would be short-term (3 hours on average per day) and will be mitigated through the Fauna Management Plan (Appendix N), detailed in Section 6.6.8 and included in Appendix N. Consequently, the activity is not predicted to result in population level impacts.
- The largest shelf-edge area of behavioural disturbance, based on the maximum behavioural effect distance of 22.8 km along the self-edge and 12.6 km on the shelf during resupply, is 1,633 km^2, which is approximately 0.07% of the southern right whale migration BIA (2,441,611 km^2).
- Any behavioural impacts from this activity would be short-term, i.e. for the duration of resupply only, and will be mitigated through the Fauna Management Plan, detailed in Section 6.6.8 and included in Appendix N. Consequently, the activity is not predicted to result in population level impacts (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41, 46).

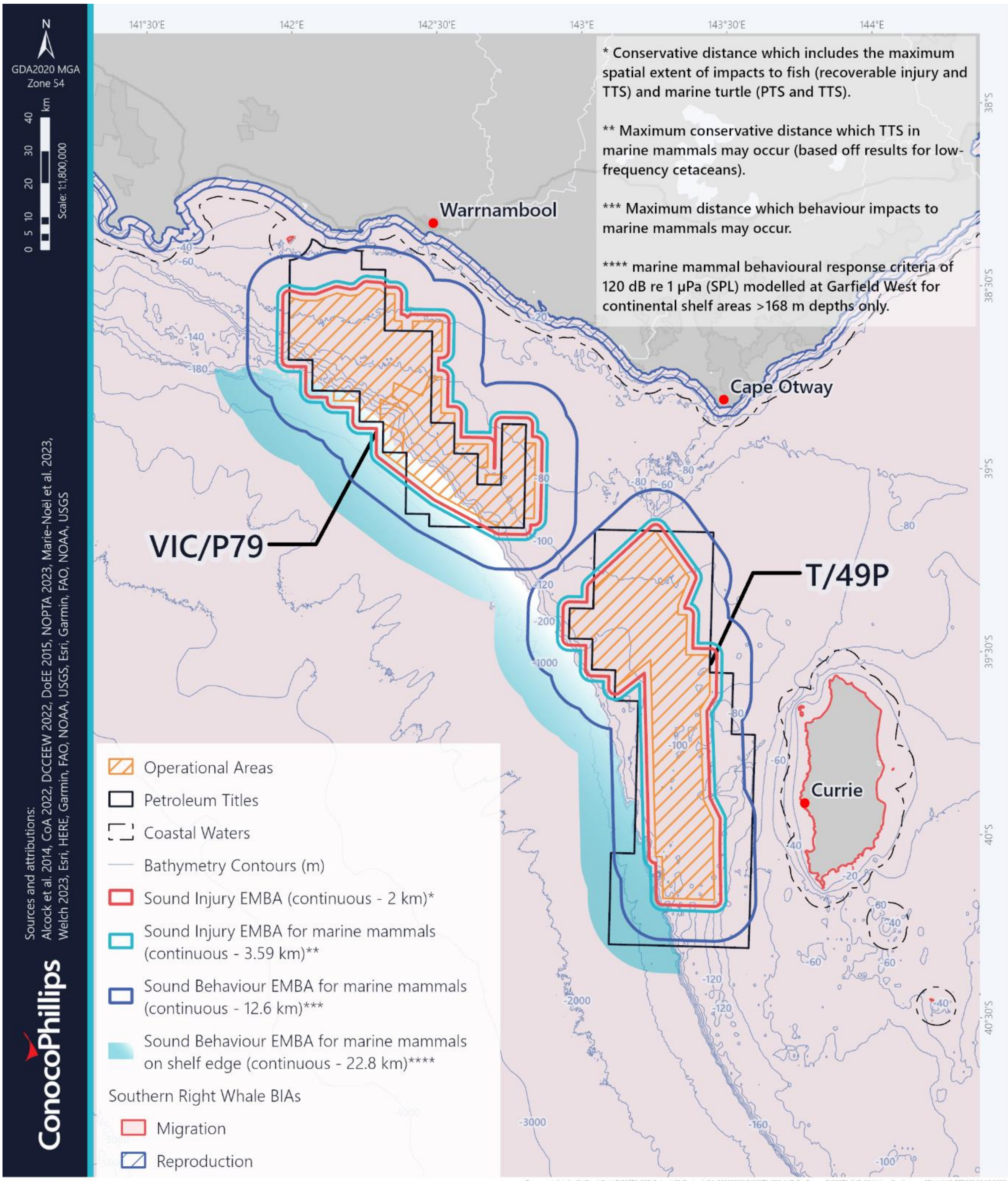


Figure 6-27: Southern right whale BIAs, migration and reproduction and sound EMBA

Other Whales

During consultation, the importance of the Bass Strait is a migratory route for humpback whales and dwarf minke whales was reiterated (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41, 44).

Whilst under the Tasmanian Threatened Species Protection Act 1995 the humpback is listed as endangered there is no state conservation management plan detailing threats to the species. The NRE Tasmania Conservation site (NRE Tasmania 2023) refers to the Commonwealth Conservation Advice for the Humpback Whale. Whilst Commonwealth listing advice for the humpback whale states the species is no longer listed as Vulnerable it still lists noise from drilling and shipping activities as a threat. However, due to the short duration of drilling and supporting vessel activities individuals may be affected but there will be no affect at a population level.

The dwarf minke whale is not listed as threatened species under the Tasmanian Threatened Species Protection Act 1995 or the EPBC Act, and there is no conservation advice that identifies anthropogenic sound as a threat. Due to the short duration of drilling and supporting vessel activities it is predicted that, although individuals may be affected, there will be no affect at a population level.

Foraging behaviour for fin (*Balaenoptera physalus*) (EPBC Act: vulnerable; listed Migratory), pygmy right (*Caperea marginata*) (EPBC Act: listed Migratory), and sei (Balaenoptera borealis) (EPBC Act: vulnerable; listed Migratory) whales has been identified in the area where PTS, TTS and behavioural disturbance criteria are reached (Table 6-28). As detailed in EP Section 4.6.9.2, these species may be foraging within the Otway Basin from November to May, when exploration activities may be occurring. However, no biologically important areas were identified for fin, sei or pygmy right whales within the Sound EMBAs.

The consequence severity of continuous underwater sound on other low-frequency foraging whales, is assessed as **Moderate (3)** based on:

- The conservation advice for fin whales (TSSC 2015d) and sei whales (TSSC 2015c) list 'anthropogenic noise and acoustic disturbance' as a threat to these species, however, the consequence advice lists the threat with a consequence rating as 'minor'.
- Pygmy right whales and dwarf minke whales are not listed as threatened species under the EPBC Act. Therefore, there is no conservation advice that identifies anthropogenic sound as a threat.
- Low numbers of fin, sei and pygmy right whales are expected within the area, primarily associated with the Bonney Coast Upwelling as a known feeding aggregation area. Only a small area of the Bonney Coast Upwelling KEF is overlapped by the largest on-shelf threshold distance (12.6 km EMBA for behavioural disturbance). Therefore, any impacts to their known feeding aggregation area are expected to be temporary and localised.
- Fin, sei and pygmy right whales are not resident in the area. However, their distribution is be expected to be throughout the Bonney Coast Upwelling KEF and adjacent waters based on where krill aggregations occur.
- All vessels will adhere to the distances and vessel management practices of EPBC Regulation (Part 8) and will implement an increased caution zone of 500 m between whales and vessels.
- Vessels conducting geotechnical sampling under DP will implement mitigation measures including pre-start surveys and shut-down procedures for foraging fin, sei and pygmy right whales.
- No changes in prey availability are predicted based on the low risk of near, intermediate or far-ranging effects to fish eggs and larvae associated with non-impulsive noise (Popper et al. 2014).
- The adopted control measures, detailed in Section 6.6.8 will effectively mitigate PTS, TTS and behavioural impacts to cetaceans undertaking biologically important behaviours within the area during exploration activities.

6.6.7.2. Socio-economic Receptors

Multiple fisheries were identified to overlap the conservative threshold distance to impact fish (2 km EMBA for injury to fish described in Section 6.2.4.7). Only a number of these have recorded fishing activity within the last five years, including:

- Commonwealth Southern and Eastern Scalefish and Shark Fishery
- Victorian and Tasmanian Giant Crab Fishery

- Victorian and Tasmanian Rock Lobster Fishery

The EPBC Act PMST Report for fish conducted on the conservative threshold distance identified for fish species (Appendix B) (2 km EMBA for injury to fish) did not identify any of the target fish species for the Commonwealth Southern and Eastern Scalefish and Shark Fishery.

During consultation, feedback was provided regarding the impact of underwater sound on the catchability of fish in general, and pelagic species more specifically in the Eastern Tuna and Billfish Fishery (Org ID: 479, Event ID: 3821, FB ID: 415; Org ID: 406, Event ID: 3850, FB ID: 401; Org ID: 428, Event ID: 2500, FB ID: 242). Acoustic mapping of pelagic fish distribution and abundance immediately prior to and after a seismic survey off the Norwegian coast found that this noise source had insignificant short-term scaring effects, with vertical movement indicated as a short-term reaction for some pelagic species (Slotte et al. 2004). Given that seabed surveys (1-week per location) and drilling activities (30-90 days per location) are short-term, temporary and emit lower levels of underwater sound compared to a seismic survey, behavioural disturbance is not predicted to affect catchability or the migration of pelagic species.

In addition, during consultation it was reported that drilling operations can attract bait and pelagic fish, reducing the catch available for commercial fishers (Org ID: 550, Salty Dog Fishing Charters, Event ID: 1141, FB ID: 25). Popper et al (2014) found most fish species are expected to exhibit avoidance behaviours to sound emissions.

The consequence severity of continuous underwater sound on socio-economic receptors is assessed as **Minor (2)** based on:

- No commercial fisheries target species were identified within the fish injury EMBA (2 km; refer to Appendix B). Thus, impacts to these fisheries are considered unlikely, and any impact that occurs will be localised and not cause long-term impacts to stocks.
- Sound exposure impacts to invertebrates (i.e. giant crab and southern rock lobster) are expected to be restricted to within metres of the continuous sound source. At such a localised extent, impacts would be negligible at an ecosystem or population level (see Appendix G for further details) and change in catch is considered highly unlikely.
- Displacement of commercial fishers from fishing areas has been assessed in Section 6.2; therefore, displacement impacts have not been evaluated further.
- During consultation it was raised that fish may move towards drilling rigs, reducing the catch available for commercial fisheries. This is not supported by published studies (e.g. Popper et al. 2014); however, any changes in catch availability due to attraction by the rig will be limited to the duration of the activity, and fully recoverable.

6.6.7.3. Conservation Values and Sensitivities

The furthest sound criteria, of 12.6 km for behavioural disturbance (from on-shelf locations) was identified to overlap an area of the Zeehan Commonwealth Marine Reserve (Special Purpose Zone and Multiple Use Zone – IUCN Category VI), and Apollo Commonwealth Marine Reserve (Multiple Use Zone – IUCN Category VI). Noise pollution associated with shipping, other vessels, seismic survey, offshore mining operations and offshore construction is listed as a pressure on the conservation values of the South-east Marine Reserve Network within the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013). The Plan requires that potential impacts of allowable activities on the conservation values of the marine reserves network are identified and avoided or mitigated by appropriate assessment and authorisation processes, such as the OPGGS Act.

As described within Section 4.4.1 the conservation values for the Apollo Marine Reserve include benthic habitats and communities, cultural and heritage sites, and ecological receptors, such as pinnipeds, cetaceans, seabirds (DNP 2013). The Zeehan Marine Reserve conservation values include seafloor habitats, cetaceans and seabirds (DNP 2013).

The maximum effect distances of 12.6 km from on-shelf locations, and 22.8 km from shelf-edge locations in the offshore direction, were identified to overlap a small area of the West Tasmania Canyon, a key ecological feature identified for the South-east Marine Region, located on the edge of the continental shelf offshore of the north-west corner of Tasmania (DoE 2015b). As described in Section 4.4.9.2, these canyons are associated with upwellings and high productivity. Sponges are concentrated near the canyon heads, with the greatest diversity between 200 m and 350 m depth. This high productivity area is associated with abundance of fishes, including fish nurseries (blue warehou and ocean perch), foraging seabirds (albatross and petrels), white shark and foraging blue and humpback whales.

The maximum effect distance of 12.6 km from on-shelf locations was identified to overlap a small area of the Bonney Coast Upwelling, a key ecological feature identified for the South-east Marine Region, located in in south eastern South Australia (DoE 2015b). As described in Section 4.4.9.1, the Bonney Coast Upwelling is defined as a KEF as it is an area of enhanced pelagic productivity which causes high aggregations of marine life to occur, such as pygmy blue, sei and fin whales (DCCEEW 2015a).

The consequence severity of continuous underwater sound on conservation values and sensitivities is assessed as **Minor (2)** based on:

- Although noise pollution is listed as a pressure on the conservation values of the South-east Marine Reserve Network, ConocoPhillips Australia has undertaken to identify and mitigate impacts.
- The impacts of underwater sound emissions on the conservation values (i.e. pinnipeds, cetaceans and fish) for the Apollo and Zeehan Commonwealth Marine Reserve, the West Tasmania Canyon and the Bonney Coast Upwelling KEF has been assessed in Section 6.6.7.1.
- The Wildlife Conservation Plan for Seabirds (DCCEEW 2020) and the National Recovery Plan for albatrosses and petrels (DCCEEW 2022e) do not identify underwater sound emissions as a threat. Seabirds, such as albatross and petrels, are not anticipated to remain within the area of impact (i.e. the water column) long enough to experience PTS and TTS, or behavioural impacts. Therefore, displacement or impacts are unlikely.
- The adopted control measures, detailed in Section 6.6.8 will reduce possible PTS, TTS and behavioural impacts to conservation values and sensitivities that may be sensitive to underwater sound and are likely to be present within the area during exploration activities.

6.6.7.4. Cultural Environment

Continuous sound emission EMBAs are located entirely in the offshore marine environment. As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the continuous sound emission EMBAs overlap Sea Country for the duration of the project.

Changes to the physical environment, such as changes to ambient sound levels, are not specifically listed as an issue of concern in the Kooyang Sea Country Plan (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation 2004). However, environmental protection and the general health of the country are considered a key issue. The Plan focuses on integration of First Nations peoples voices into the management and protection of the environment, and research needs to allow for effective on-going management and protection (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation 2004).

The evaluation of impacts to the ecological environment concludes a consequence of **Moderate (3)** to low frequency cetaceans, **Minor (2)** for fish, kooyang (eels) and marine reptiles, and **Negligible (1)** or no impact predicted for all other ecological receptors. No long-term or population level impacts are predicted, and underwater sound emissions will be managed in a manner as to not impact on the recovery of pygmy blue whales and southern right whales, as per the CMPs (DoE 2015, DWESPaC 2012b).

Southern right whales, or 'koontapool', are recognised by First Nations people as Gunditjmara Ancestors. The areas identified as SRW BIAs are also recognised by the Gunditjmara as sacred birthing areas. These 'Koontapool Woorrkngan Yakeen' - Whale Birthing Dreaming Sites, located in specific bays east of the Hopkins River, Victoria, and back east along the coast, are known resting and feeding sites for southern right whales; safe havens for mothers and babies (DCCEEW 2022). These places on Country are directly related to 'Gunditjmara Neeyn' (midwives) (DCCEEW 2022). Every year, locals gathered on Gunditjmara Sea Country for the first public welcoming of koontapool back to her traditional birthing waters.

The inherent consequence evaluation for southern right whales assessed potential impacts from continuous sound emissions as **Moderate (3)**, based on the potential for behavioural impacts whilst undertaking biologically important behaviours. Implemented control measures (identified in Table 6-30) will limit the nature and scale of any impacts, reducing impacts to low frequency cetaceans (including southern right whales) to **Minor (2)** levels in line with the requirements of the CMP, with no long-term or population level impacts predicted that may affect the recovery of this species.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by atmospheric emissions.

6.6.8. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context B** has been applied:

- Impacts are relatively well understood, and uncertainty has been managed through specific modelling
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Additional control measures have been considered to ensure lower and higher-order impacts are managed to ALARP and acceptable levels.

Table 6-29: Control measures and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
CM02: Vessel and MODU Operating Procedures	EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans describes strategies to ensure whales and dolphins are not harmed during offshore interactions with vessels and helicopters. All vessels will adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and will implement an increased caution zone of 500 m between whales and vessels.
CM08: Fauna Management Plan (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 46)	**Marine Fauna Observers** (Org ID: 597, Event ID: 1144, FB ID: 35) • Dedicated MFOs with experience in whale observation, distance estimation and reporting, will undertake observations. • In addition, facility crew who act as Officer of the Watch will receive training from the MFO in whale observation and distance estimation to assist the MFO during daylight hours. • For activities greater than 5 consecutive days at sea with >12 hours daylight, an additional dedicated MMO trained in whale observation, distance estimation and reporting will support the experienced MMO. As part of the activity induction all vessel and MODU crew will receive information on the EP noise controls and the importance of reporting whale sightings to the vessel MMO immediately. The Fauna Management Plan (Appendix N) outlines specific measures to minimise anthropogenic noise threats to relevant species, including the implementation of increased safe operating distances between vessels and whales, pre-activity surveys for specific activities, night-time and low visibility controls and establishment of safe points for operational activities in accordance with the Safety Case and Well Integrity requirements (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 46).
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).
CM01: Marine Assurance Process CM02: Vessel and MODU Operating Procedures	Power generation and propulsion systems on the MODU and vessels will be operated in accordance with manufacturer's instructions and ongoing maintenance to ensure efficient operation.

Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Do not undertake the activity	Eliminate any potential impacts from anthropogenic underwater sound.	Given that DAWE assesses the potential impacts of shipping and industrial noise as 'minor' i.e., 'individuals are affected but no affect at population level' the potential environmental benefits of not undertaking the activity in relation to noise generation are also considered minor. ConocoPhillips Australia does not consider this control as feasible.	Reject
Reduction			
Limit vessel DP thruster power	Limiting the DP thruster power to reduced levels	Limiting the thruster levels has the potential to limit vessel operations.	Reject

	would reduce the resulting sound levels generated.	ConocoPhillips Australia does not consider this control as feasible, as the premise for safe vessel operations, particularly in heavy sea states, requires unlimited power.	
Implementation of soft starts	Soft starts (under the EPBC Act Policy 2.1) are typically applied to seismic surveys to slowly ramp up the seismic source to allow fauna to move away from the source, potentially reducing impacts.	No seismic source will be used for the activity. However, soft-starts are typically conducted as part of normal drilling operations, whereby drilling commences at a slower rate to minimise downhole vibrations and torque, effectively reducing the initial sound levels from this activity and allowing for fauna to move away. Therefore, ConocoPhillips Australia considers this control measures is already in place for drilling. Note: Soft-starts associated with impulsive sound sources (e.g. VSP) addressed in impulsive sound. [Updated in response to Matter M24 and M35].	Adopt CM09: Drilling Program
Avoid periods of marine fauna sensitivity (i.e. whale migration, foraging)	Reduce risk of impacts from sound emissions during environmentally sensitive periods for listed marine fauna.	High cost in moving or delaying activity schedule. The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. There is no period when there is not a whale undertaking a biologically important behaviour within the Otway region. Additional controls, above the legislative requirements of the EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans, will be implemented to manage potential impacts to whales undertaking biologically important behaviours.	Reject
Avoid periods of marine fauna sensitivity (i.e. whale migration)	Reduce risk of impacts from sound emissions during environmentally sensitive periods for southern right whales with calves within the migration BIA.	High cost in moving or delaying activity schedule. The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. There is no period when there is not a whale undertaking a biologically important behaviour within the Otway region. Additional controls, above the legislative requirements of the EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans, will be implemented to manage potential impacts to whales undertaking biologically important behaviours.	Reject
Do not operate, or limit the operation of the thruster assisted mooring system	Reduces short-term, infrequent noise emissions in heavy sea states.	Evaluation of trade-offs indicates that not using the thruster assisted mooring system increases the likelihood of mooring system fatigue, downtime associated with management of mooring system fatigue, such as anchor relay or conductor replacement, with associated increases in emissions, discharges, seabed impacts and drilling duration. COPA considers that the trade-offs associated with not using the thruster assist mooring system are grossly disproportionate to the	Reject

		benefit gained, being short-term infrequent reductions in variable non-impulsive noise levels.	
Mitigation			
Management Plan for Blue Whales (The impact assessment has shown the potential for interaction between blue whales and the activity, with some uncertainty around presence/ absence).	Addresses uncertainty through the implementation of management measures that monitor for presence and implement controls to prevent injury and displacement.	Cost and time to implement additional management measures applicable to blue whales is considered feasible as part of the Fauna Management Plan (Appendix N). In accordance with Action A.2.3 of DAWE's guidance (2021) Anthropogenic sound in biologically important areas will be managed, such that any blue whale continues to utilise the area without injury and is not displaced from a foraging area.	Adopt CM08: Fauna Management Plan
Management Plan for Southern Right Whales (The impact assessment has shown the potential for interaction between southern right whales and the activity, with some uncertainty presence/absence).	Addresses uncertainty through the implementation of management measures that monitor for presence and implement controls to prevent injury and protect biologically important behaviours.	Cost and time to implement additional management measures applicable to southern right whales is considered feasible as part of the Fauna Management Plan (Appendix N). Anthropogenic sound in biologically important areas will be managed, such that any southern right whale continues to utilise the area without injury and is not displaced from a migration BIA.	Adopt CM08: Fauna Management Plan
Shut-down procedures	Limit sound exposures by shutting down contributing components.	Support vessels are required to be available for immediate use during the period that they are performing MODU safety standby services. Shutting down vessel propulsion systems could introduce safety and environmental risks including vessel drift and collision, impairment of critical equipment, dropped or swinging objects from crane or derrick resulting in stability impairment. The ability to implement a safe shutdown will vary depending on activities at the time. This process can range from 4 hours to multiple days to ensure the well is safely secured and well integrity established, such that the MODU can then be safely shut down to only critical systems. As a result, the use of shutdown zones for the MODU is not considered feasible or practicable.	Reject
Monitoring			
Dedicated Marine Fauna Observers (MFOs) (Org ID: 597, Event ID: 1144, FB ID: 35)	Improved ability to spot and identify marine fauna at risk of impact by activity sound.	Additional cost of contracting specialist MFOs is considered feasible and is necessary to implement the Fauna Management Plan (Appendix N). Vessels are sufficiently large for an MFO to be able to accurately identify whales up to 3-3.5 km. The support vessels will be moving around the MODU with the MMO able to observe towards and away from the MODU thus increasing observation distances. MFOs are not required on the MODU as visibility is obstructed due to the position of the derrick.	Adopt CM08: Fauna Management Plan

Acoustic Monitoring (AM)	AM can be used to detect marine mammal calls, and support sightings made by MFOs. Currently available AM technologies are most useful in the detection of odontocetes known to emit regular distinctive clicks and high frequency calls during long dives. However – technology development specific to low frequency whale detections is currently underway in Australia. (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 48)	Historically, AMs has had limited utility in detecting lower frequency calls of baleen whales (such as blue whales) especially when in the presence of constant background low frequency sound such as that generated by the MODU and vessel(s) towing the AM system. The cost of a AM system is high for a short-duration activity and would require a number of permanent moored systems or multiple ASVs/gliders around the operational area with real-time telemetry and analysis. Given the role of AM to inform mitigation decision making in low visibility and at night, and its ability to detect vocalisations over large distances, the cost and effort are not considered grossly disproportionate to the benefit gained as part of a multifaceted approach to whale detection.	Adopt CM08: Fauna Management Plan
Aerial Surveys	Increased confidence no foraging blue whales in the vicinity which could be injured or displaced.	Aerial surveys have been used successfully to inform the level of risk within operational areas. The cost of aerial surveys is high for a short-duration activity and the evaluation of trade-offs identifies HSE risks (which have been managed effectively in the past), weather restrictions which may hamper effectiveness for adaptive management and additional emissions associated with flights. Given the role of aerial surveys to inform the level of risk over large distances, the cost and effort are not considered grossly disproportionate to the benefit gained as part of a multifaceted approach to whale detection.	Adopt CM08: Fauna Management Plan
Satellite Imagery	Satellite imagery can be used to gather oceanographic and biological information to support the understanding of presence of marine mammals in the area.	Reliability is likely to be low given meteorological conditions in the area and need for cloudless conditions. Challenges identified with tasking conflicts and data accuracy to support ID to species, with limited additional benefit relative to accepted controls.	Reject
Drone Surveys	Drones could provide a method of increasing the observation distance of MFOs.	It is not known if drone surveys have been effectively used as a real-time monitoring method to date due to the physical range of drones being (4 – 5km), drone operations are sensitive to wind limiting operations in the Otway. As MFOs will be present, ConocoPhillips Australia consider there to be a negligible observation benefit provided by drones. The associated costs, dropped object risk and operational limitations are disproportionate to the negligible environmental benefit.	Reject
Infra-red systems	Infra-red (IR) systems could enhance the ability of	Infra-red (IR) systems are limited in their effective distance ranges and do not extend	Reject

	MFOs to visually detect the presence of foraging or potentially foraging whales within close proximity to the system.	out to the distances required to make them effective. Poor performance of IR system has been reported in sea states greater than Beaufort Sea State 4 and conditions such as fog, drizzle, rain limit detections (Verfuss et al. 2018; Smith et al. 2020). Reliability and effectiveness are unknown/ untested and considered lower than direct observations, with limited additional benefit relative to accepted controls.	
Monitoring upwelling events	Monitoring precursors to upwelling events could inform the level of risk of blue whale encounter	There is a lag between changes in sea surface temperature and increased primary production leading to krill swarms, and the presence of feeding whales. This lag has been identified in some studies on upwelling / krill / blue whale foraging presence as between 1 to 4 months. As such, monitoring SST and chlorophyll-a monitoring does not provide a robust prediction of blue whale feeding activity in the project area.	Reject

Residual Impact Consequence Ratings	
Fish (including eels, sharks and rays)	**Minor (2)**
Marine Turtles	**Minor (2)**
Birds	**Negligible (1)**
Otariid Seals	**Minor (2)**
Very High Frequency Cetaceans	**Negligible (1)**
High Frequency Cetaceans	**Negligible (1)**
Low Frequency Cetaceans	**Minor (2)**
Socio-economic Receptors	**Minor (2)**
Conservation Values and Sensitivities	**Minor (2)**
Cultural Environment	**Minor (2)**
ALARP Statement	The decision context has been assessed as Type B, with predictive uncertainty managed through sound modelling. The residual consequence ratings are lower order - Minor (2), with higher-order Moderate (3) rating for low frequency cetaceans reduced to Minor (2) through the implementation of a Fauna Management Plan (Appendix N). The adopted control measures minimise impacts from continuous sound and are considered effective and appropriate to the temporary and reversible nature of the predicted impacts. The adopted engineering, procedural and administrative control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted impacts to receptors from continuous sound emissions associated with the Otway Exploration Drilling Program are reduced to ALARP.

6.6.9. Acceptability Assessment

Table 6-30 compares the predicted impact levels of continuous underwater sounds against the defined acceptable levels.

Table 6-30: Comparison of defined acceptable levels with impact levels for Underwater Sound - Continuous

<table>
<tr><th colspan="2">Defined Acceptable Levels</th><th rowspan="2">Predicted Impact Level</th><th rowspan="2">Is predicted impact below defined acceptable level?</th></tr>
<tr><th>Source</th><th>Level</th></tr>
<tr><td>Principles of ESD</td><td>Activities that result in temporary / reversible, small scale, and/or low intensity environmental damage.
Environmental impacts and risks have a worst-case consequence ranking less than Major (4).</td><td>Planned activities expected to result in impacts ranging from **Negligible (1)** to **Minor (2)**, depending on species.</td><td>Yes</td></tr>
<tr><td>Principles of ESD</td><td>Enough appropriate information to understand impact/risk of serious/irreversible environmental damage.
Application of the precautionary principle in the presence of scientific uncertainty.</td><td>There is high confidence in the prediction.</td><td>Yes</td></tr>
<tr><td>Principles of ESD</td><td>EPBC Program Requirements:
The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.</td><td>Underwater sound emissions are listed as a threat within:
• The recovery Plan for Marine Turtles in Australia (CoA 2017).
• Conservation Management Plan for the Blue Whale (DoE 2015).
• Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b).
• Conservation advice for fin whales (TSSC 2015d).
• Conservation advice for sei whales (TSSC 2015c).
• Recovery Plan for the White Shark (DSEWPaC 2013a).
The following does not identify underwater sound emissions as a threat:
• South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013).
• National Recovery Plan for albatrosses and petrels (DCCEEW 2022e).
• Wildlife Conservation Plan for Seabirds (DCCEEW 2020)
The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).</td><td>Yes</td></tr>
<tr><td>Biological</td><td rowspan="3">No death or injury to listed threatened and migratory species, from the activity.
Biologically important behaviours can continue while the activity is being undertaken.
Anthropogenic noise in biologically important areas will be managed such that:
• Any blue whale continues to utilise the area without injury,</td><td rowspan="3">There is a **Negligible (1)** to **Minor (2)** consequence level because the behaviour of marine fauna cannot be controlled. However, with the control measures adopted, the likelihood of continuous sound causing death, injury or behavioural disturbance to threatened species is remote.</td><td rowspan="3">Yes</td></tr>
<tr><td>Ecological</td></tr>
<tr><td>Economic</td></tr>
</table>

Defined Acceptable Levels		Predicted Impact Level		Is predicted impact below defined acceptable level?
Source	**Level**			
Cultural	and is not displaced from a foraging area • It does not prevent any southern right whale form utilising the area of cause injury (TTS and PTS) and/or disturbance			
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted controls measures as listed above have been assessed to ensure that environmental impacts will be of an acceptable level throughout the Otway Exploration Drilling Program.		Yes
ConocoPhillips Australia Policies	Environmental impacts and risks are consistent with environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).	Consequence	**Negligible (1)** to **Minor (2)**	Yes
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to atmospheric emissions have been considered (with more detail provided in Section 3). These include: • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 40 – Sound from dynamic positioning • Org ID: 578, AMOG Consulting, Event ID: 3893, FB ID: 418 – Literature on invertebrates • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 37 – Effects on fauna • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 36 – Impacts of anthropogenic sound • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41-44; Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 53; Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 2690, FB ID: 155 – Species for consideration in assessment, BIAs, important behaviours • Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 2690, FB ID: 143, 155; Event ID: 3860; FB ID: 154 – Impacts to little penguins • Org ID: 597, Event ID: 1144, FB ID: 32, 33 – Presence of breeding colonies of fur-seals at Deen Maar • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 52 – Impacts on prey species • Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 373, Org ID:		Yes

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
		524, Wilderness Society, Event ID: 3480, FB ID: 377, 396; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 365; Org ID: 7, Director of National Parks (DNP), Event ID: 2470, FB ID: 243 - Process for evaluating activity limitations relevant to environmentally sensitive periods for cetaceans • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 38 – Advise regarding seasonal avoidance • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 49 – ConocoPhillips Australia's survey dataset • Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467 – Migration BIA for southern right whales • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41, 46 – Specific considerations and monitoring and mitigation actions • Org ID: 479, Event ID: 3821, FB ID: 415; Org ID: 406, Event ID: 3850, FB ID: 401; Org ID: 428, Event ID: 2500, FB ID: 242 – Impacts on fish catchability and migration • Org ID: 550, Salty Dog Fishing Charters, Event ID: 1141, FB ID: 25 – Attraction of fish to noise • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 48 – Acoustic monitoring • Org ID: 597, Event ID: 1144, FB ID: 35 – Marine fauna observers • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 278, 280, 309, 338 – Impacts to southern rock lobsters	
International Standards	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type B impacts are considered acceptable if the requirements in Table 6-15 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4). Further to this, following the completion of the impact assessment process, the impact of underwater continuous sounds from seabed survey vessels, the MODU and support vessel operations on receptors is acceptable because:		

<table>
<tr><th colspan="2">Defined Acceptable Levels</th><th rowspan="2">Predicted Impact Level</th><th rowspan="2">Is predicted impact below defined acceptable level?</th></tr>
<tr><th>Source</th><th>Level</th></tr>
<tr><td></td><td colspan="3">

Pinnipeds (otariid seals) and high-very high frequency cetaceans will benefit from the controls put in place for EPBC listed low frequency cetaceans.
Following instruction from the Conservation Advice documents and Recovery Plans for each of the threatened cetacean species, anthropogenic sound and acoustic disturbance will not be a threat as appropriate consideration has been given to the implementation of controls to minimise impacts to an acceptable level.
The Conservation Management Plans for the Blue Whale (DoE 2015) and Southern Right Whale (DSEWPaC 2012b) plus industry standard control measures have been improved for blue whales and southern right whales because of their conservation status and the presence of cause-effect pathways that could lead to unacceptable impacts, and
Impacts associated with underwater sound from the Otway Exploration Drilling Program are considered to be of an acceptable level given the likelihood of continuous sound causing death, injury or behavioural disturbance to threatened species is remote with the control measures in place.

The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of underwater continuous sound emissions on identified receptors.
Although the impacts of underwater sound meet the defined acceptable levels, the impacts may be successive, additive or synergistic when considered in relation to other significant activities or projects over temporal and spatial scales. As a result, the potential for cumulative impacts to threatened species related to continuous underwater sound emissions has been assessed further in Section 8.
</td></tr>
</table>

6.6.10. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with non-impulsive underwater sound from the Otway Exploration Drilling Program are:

- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO4: Biologically important behaviours can continue while the activity is being undertaken.
- EPO9: Anthropogenic noise in biologically important areas will be managed such that:
    - Any blue whale continues to utilise the area without injury, and is not displaced from a foraging area.
    - It does not prevent any southern right whale from utilising the area or cause injury (TTS and PTS) and/or disturbance.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

6.7. Underwater Sound Emissions - Impulsive

6.7.1. Hazards

Sound emissions can be categorised as continuous (non-impulsive) or impulsive. Impulsive noise is a category of sound that is described by acute, broadband, transient signals or pulses with a sudden start and short duration (Org ID: 593, Event ID: 2676, FB ID: 141). Continuous sound sources are assessed in Section 6.6.

The Otway Exploration Drilling Program will generate impulsive underwater sound emissions from the following activities:

- Geophysical surveys using multibeam echosounder (MBES), side scan sonar (SSS) and sub-bottom profiling (SBP) as described in section 2.2.1, and
- Downhole formation evaluation which may involve a range of techniques including Vertical Seismic Profiling (VSP) as described in section 2.2.3.

Based on a review of the operating frequency ranges and source levels of the above activities, it was identified that:

- SBP will generate the greatest frequency range and maximum impulsive source levels for the seabed survey, and
- VSP represents the loudest sound source and will be used to determine the worst-case consequence evaluation for well formation evaluation, providing a conservative estimate for impulsive underwater sound from this activity.

It was acknowledged during consultation with some relevant persons, that the low frequency MBES and SBPs likely to be used for seabed surveys are usually considered to cause less direct impact to marine organisms compared to seismic systems (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 39).

6.7.2. Underwater Sound Modelling

Ambient sound levels in the Otway Basin have been measured as part of previous impact assessment activities for the petroleum industry. Acoustic monitoring conducted by Santos (2004) recorded broadband underwater sounds of 93 to 97 dB re 1 µPa. Passive acoustic monitoring, commissioned by Origin, conducted 5 km offshore from the coastline east of Warrnambool, identified that ambient underwater noise in coastal areas are generally higher than offshore waters, with a mean of 110 dB re 1 µPa and maximum of 161 dB re 1 µPa (Duncan et al. 2013).

Sub-bottom Profiling (SBP)

Sub-Bottom Profiling (SBP) systems are used to determine the physical properties of the seabed and to image and characterise geological information below the seabed and evaluate the near-seabed stratigraphy for hazards. SBP utilises an acoustic source typically towed just behind the vessel, with a hydrophone towed approximately 25 m behind the vessel to record the reflected sound waves. Modelling was conducted for two representative (shallow to typical on-shelf) locations using a conservative triple-plated boomer system with a verified source level of 169.0 dB 1 μPa^2m^2s (Appendix G).

Vertical Seismic Profiling (VSP)

Jasco Applied Sciences (JASCO) were contracted to undertake a modelling study of underwater sound levels associated with the ConocoPhillips Australia exploration program. Impulsive sound will be generated by the VSP equipment (i.e. air gun) during the activity. The source will likely be a three 250 cubic inch air gun configuration deployed approximately 5m below the water surface from the MODU or support vessel. VSP is anticipated to take less than approximately 20 hours per well (for a maximum of 6 wells), with up to 130 shots, and is undertaken at the completion of drilling.

VSP transmits impulsive sound energy from a sound source, positioned in the water just over the side of the MODU, to a number of receivers in the well bore. Although the sound energy is focussed towards the seabed and is loudest directly under the source, it also ensonifies the surrounding water column. Each discharge of the sound source generates a short, discrete, low frequency sound impulse, which rapidly decreases with distance from the source. The sound level generated by VSP is much lower than the sound level generated during 2D or 3D marine seismic surveys (MSS).

JASCO conducted modelling for activities across three broad areas, the northern extent of VIC/P79, the southern extent of VIC/P79 and T/49P (Matthews et al. 2023: Appendix G). The considered locations were selected to estimate sounds levels that would be representative of all locations within each operational area based on water depth, proximity to the continental slope and seabed type.

JASCO modelled the pressure signature of the individual airguns and the composite decidecade band point-source equivalent directional levels (i.e., source levels) of the VSP activity with JASCO's Airgun Array Source Model. The maximum sound exposure level (SEL) from the VSP activities was modelled around 216 decibels (dB) re 1µPa^{2}m^2 s.

The results presented below represent the maximum distance from locations within the northern and southern extents of VIC/P79 and T/49P operational areas, to represent the range of predicted impacts and ensure the evaluation is based on the most conservative results.

6.7.2.1. Exposure Criteria Thresholds

JASCO performed modelling studies which assessed distances from activities where underwater sounds levels reached exposure criteria corresponding to various levels of potential impact to marine fauna. The marine fauna considered was based on a review of receptors that may be impacted by impulsive sounds, including marine mammals, marine turtles, fish (including fish eggs and larvae), and invertebrates. The following exposure criteria thresholds to be selected for the modelling and the impact assessment were based on current best available science and those which have been accepted by regulatory agencies:

- Peak pressure levels (PK) and frequency-weighted accumulated sound exposure levels (SEL24h) from the US National Oceanic and Atmospheric Administration (NOAA) Technical Guidance (NMFS 2018) for the onset of Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) in marine mammals that may be undertaking biologically important behaviours, such as calving, foraging, resting or migration (as defined by Commonwealth of Australia 2015a).
- The current interim NMFS (NOAA 2019) criterion of 160 dB re 1 µPa (SPL) for impulsive sound sources for marine mammals' behavioural threshold.
- Maximum-over-depth low frequency cetacean weighted per-pulse sound pressure level 140 dB re 1 µPa (SPL) for assessing more nuanced responses to impulsive noise for migrating southern right whale cow-calf pairs from Wood et al. (2012) (with additional information on the application of this threshold provided below).
- Peak pressure levels (PK) and frequency-weighted accumulated sound exposure levels (SEL24h) from Finneran et al. (Finneran, et al. 2017) for the onset of PTS and TTS in marine turtles.
- Marine turtle behavioural response threshold of 166 dB re 1 µPa (SPL) (CoA 2017) as applied by the US NMFS, along with a sound level associated with behavioural disturbance 175 dB re 1 µPa (SPL) (McCauley, et al. 2000).
- Sound exposure guidelines for fish (including eels), fish eggs and larvae (Popper, et al. 2014).
- PK-PK sound level of 202 dB re 1 µPa (Payne et al. 2008; Sole et al. 2023 – identified during consultation (Org ID: 578, AMOG Consulting, Event ID: 3893, FB ID: 418), is considered to be associated with no effect, and was therefore applied in this assessment. Additionally for context related to different levels of potential impairment, the PK-PK sound levels determined for crustaceans in Day et al. (2016b), 209–212 dB re 1 µPa and 213 dB re 1 µPa from Day et al. (2019), were also included.
- There are no thresholds for underwater sound impacts to birds therefore no modelling was conducted. Southall et al. (2019) recommends using guidance for other carnivores in water (OCW) as a proxy. [Updated in response to Matter: B06].
- The human health assessment threshold for divers and swimmers of 145 dB re 1 µPa (Parvin 2005). [Point added in response to Matters: F16].

To assist in assessing potential behavioural responses by migrating southern right whales with calves, a graded probability of response for impulsive sounds using a frequency weighted SPL metric, as described in Wood et al. (2012), has been applied. Wood et al. (2012) defined behavioural response categories for sensitive species (including harbour porpoise and beaked whales) and for migrating mysticetes. The migrating mysticete category has been applied to southern right whale in this analysis, during migration, to assess behavioural response to impulsive sounds. The Wood et al. (2012) approach was also updated to consider the frequency weighting from Southall et al. (2019) for low-frequency cetaceans as opposed to that from Southall et al. (2007). The use of this conservative approach increases the protection afforded to this species. [Paragraph added in response to Matter: M07].

Recent Commonwealth guidance has defined injury to blue whales as both PTS and TTS hearing impairment, as well as any other form of physical harm arising from anthropogenic sources of underwater noise (DAWE 2021d).

See the JASCO noise modelling report (Appendix G) for further details on the exposure criteria (thresholds) modelled.

6.7.2.2. SBP Modelling Results

The noise effect criteria and the maximum distances to effect identified for both locations modelled for the SBP scenario, including the per-pulse sound fields in terms of maximum-over-depth SPL, SEL, PK, and seafloor PK and PK-PK and sound fields in terms of SEL accumulated over 24 hours of activity are summarised in Table 6-32.

Table 6-31: **Effect criteria and maximum distances for per-pulse sound fields and multiple-pulse SEL**

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Source
Invertebrates	Effects at seafloor	213 dB PK	-	Day et al. 2019; 2017; 2016
		212 dB PK	-	Day et al. 2016; 2017
		210 dB PK	-	Day et al. 2019; 2016
		209 dB PK	-	Day et al. 2019; 2016
	No effects at seafloor	202 dB PK	-	Payne et al. 2008
Fish: No swim bladder	Recoverable	213 dB PK 216 SEL_{24h}	- -	Popper et al. 2014
	Mortality / potential mortality	219 dB SEL_{24h}	-	
Fish: Swim bladder + fish eggs and larvae	Recoverable	207 dB PK 203 dB SEL_{24h}	- -	
Fish: Swim bladder – not involved in hearing) + fish eggs and larvae	Mortality / Potential mortality	210 SEL_{24h}	-	
Fish: Swim bladder – involved in hearing)	Mortality / Potential mortality	207 dB SEL_{24h}	-	
Fish: With or without swim bladder	TTS	186 dB SEL_{24h}	-	
Marine Turtles	Behavioural disturbance	175 dB SPL	-	McCauley et al. 2000
	Behavioural response	166 dB SPL	-	McCauley et al. 2000

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Source
	PTS	232 dB PK 204 dB SEL_{24h}	- -	Finneran et al. 2017
	TTS	226 dB PK 189 dB SEL_{24h}	- -	
LF cetacean weighted	Behavioural (SRW cow-calf pairs)	140 dB SPL	0.13	Wood et al. 2012
Marine Mammal	Behavioural	160 dB SPL	-	NOAA 2019
Low-frequency cetaceans: (humpback and pygmy blue whales)	PTS	219 dB PK 183 dB SEL_{24h}	- -	Southall et al. 2019
	TTS	213 dB PK 168 dB SEL_{24h}	- -	
High-frequency cetaceans: (dolphins, beaked whales, sperm whales)	PTS	230 dB PK 185 dB SEL_{24h}	- -	
	TTS	224 dB PK 170 dB SEL_{24h}	- -	
Very high-frequency cetaceans: (pygmy and dwarf sperm whales)	PTS	202 dB PK 155 dB SEL_{24h}	- -	
	TTS	196 dB PK 140 dB SEL_{24h}	- 0.02	
Otariid Pinnipeds	PTS	232 dB PK 203 dB SEL_{24h}	- -	
	TTS	226 dB PK 188 dB SEL_{24h}	- -	

A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).
An asterisk indicates that the sound level was not reached.

6.7.2.3. VSP Modelling Results for T/49P

The noise effect criteria and the maximum distances, from all locations within the T/49P operational area, to the potential sound impacts identified for VSP scenarios are summarised in Table 6-32.

Table 6-32: Effect criteria and results for repetitive single pulse sites (dB PK) and accumulated SEL scenarios (dB SEL24h) for T/49P

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Source
Invertebrates	Effects at seafloor	213 dB PK	*	Day et al. 2019; 2017; 2016
		212 dB PK	*	Day et al. 2016; 2017
		210 dB PK	*	Day et al. 2019; 2016
		209 dB PK	*	Day et al. 2019; 2016
	No effects at seafloor	202 dB PK	0.169	Payne et al. 2008
Fish: No swim bladder	Recoverable	213 dB PK 216 SEL_{24h}	- -	Popper et al. 2014
	Mortality / potential mortality	219 dB SEL_{24h}	-	
Fish: Swim bladder + fish eggs and larvae	Recoverable	207 dB PK 203 dB SEL_{24h}	0.04 0.04	
Fish: Swim bladder – not	Mortality / Potential mortality	210 SEL_{24h}	-	

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Source
involved in hearing) + fish eggs and larvae				
Fish: Swim bladder – involved in hearing)	Mortality / Potential mortality	207 dB SEL_{24h}	0.03	
Fish: With or without swim bladder	TTS	186 dB SEL_{24h}	0.43	
Marine Turtles	Behavioural disturbance	175 dB SPL	0.37	McCauley et al. 2000
	Behavioural response	166 dB SPL	0.92	McCauley et al. 2000
	PTS	232 dB PK 204 dB SEL_{24h}	- 0.03	Finneran et al. 2017
	TTS	226 dB PK 189 dB SEL_{24h}	- 0.27	
Marine Mammals	Behavioural	140 dB SPL 160 dB SPL	5.43 1.50	Wood et al. 2012 NOAA 2019
Low-frequency cetaceans: (humpback and pygmy blue whales)	PTS	219 dB PK 183 dB SEL_{24h}	- 0.33	Southall et al. 2019
	TTS	213 dB PK 168 dB SEL_{24h}	- 1.50	
High-frequency cetaceans: (dolphins, beaked whales, sperm whales)	PTS	230 dB PK 185 dB SEL_{24h}	- -	
	TTS	224 dB PK 170 dB SEL_{24h}	- -	
Very high-frequency cetaceans: (pygmy and dwarf sperm whales)	PTS	202 dB PK 155 dB SEL_{24h}	0.06 -	
	TTS	196 dB PK 140 dB SEL_{24h}	0.25 0.08	
Otariid Pinnipeds	PTS	232 dB PK 203 dB SEL_{24h}	- -	
	TTS	226 dB PK 188 dB SEL_{24h}	- -	

A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).
An asterisk indicates that the sound level was not reached.

6.7.2.4. VSP Modelling Results for Southern Extent of VIC/P79

The noise effect criteria and the furthest distances, from all locations within the southern extent of VIC/P79, to the potential sound impacts identified for VSP scenarios are summarised in Table 6-33.

Table 6-33: Effect criteria and results for repetitive single pulse sites (dB PK) and accumulated SEL scenarios (dB SEL_{24h}) for VIC/P79-South

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Source
Invertebrates	Effects at seafloor	213 dB PK	*	Day et al. 2019; 2017; 2016
		212 dB PK	*	Day et al. 2016; 2017
		210 dB PK	*	Day et al. 2019; 2016
		209 dB PK	*	Day et al. 2019; 2016
	No effects at seafloor	202 dB PK	0.170	Payne et al. 2008

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Source
Fish: No swim bladder	Recoverable	213 dB PK 216 SEL_{24h}	- -	Popper et al. 2014
	Mortality/potential mortality	219 dB SEL_{24h}	-	
Fish: Swim bladder + fish eggs and larvae	Recoverable	207 dB PK 203 dB SEL_{24h}	- 0.03	
Fish: Swim bladder – not involved in hearing) + fish eggs and larvae	Mortality/Potential mortality	210 SEL_{24h}	-	
Fish: Swim bladder – involved in hearing)	Mortality / Potential mortality	207 dB SEL_{24h}	0.02	
Fish: With or without swim bladder	TTS	186 dB SEL_{24h}	0.45	
Marine Turtles	Behavioural disturbance	175 dB SPL	0.35	McCauley et al. 2000
	Behavioural response	166 dB SPL	0.89	McCauley et al. 2000
	PTS	232 dB PK 204 dB SEL_{24h}	- 0.03	Finneran et al. 2017
	TTS	226 dB PK 189 dB SEL_{24h}	- 0.26	
Marine Mammals	Behavioural	140 dB SPL 160 dB SPL	6.48 1.48	Wood et al. 2012 NOAA 2019
Low-frequency cetaceans: (humpback and pygmy blue whales)	PTS	219 dB PK 183 dB SEL_{24h}	- 0.30	Southall et al. 2019
	TTS	213 dB PK 168 dB SEL_{24h}	- 2.39	
High-frequency cetaceans: (dolphins, beaked whales, sperm whales)	PTS	230 dB PK 185 dB SEL_{24h}	- -	
	TTS	224 dB PK 170 dB SEL_{24h}	- -	
Very high-frequency cetaceans: (pygmy and dwarf sperm whales)	PTS	202 dB PK 155 dB SEL_{24h}	0.06 -	
	TTS	196 dB PK 140 dB SEL_{24h}	0.14 0.07	
Otariid Pinnipeds	PTS	232 dB PK 203 dB SEL_{24h}	- -	
	TTS	226 dB PK 188 dB SEL_{24h}	- -	

A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).
An asterisk indicates that the sound level was not reached.

6.7.2.5. VSP Modelling Results for Northern Extent of VIC/P79

The noise effect criteria and the furthest distances, from all locations within the northern extent of VIC/P79, to the potential sound impacts identified for VSP scenarios are summarised in Table 6-34.

Table 6-34: Effect criteria and results for repetitive single pulse sites (dB PK) and accumulated SEL scenarios (dB SEL24h) for northern extent of VIC/P79-North

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Source
Invertebrates	Effects at seafloor	213 dB PK	*	Day et al. 2019; 2017 2016
		212 dB PK	*	Day et al. 2016; 2017
		210 dB PK	*	Day et al. 2019; 2016
		209 dB PK	*	Day et al. 2019; 2016
	No effects at seafloor	202 dB PK	0.169	Payne et al. 2008
Fish: No swim bladder	Recoverable	213 dB PK 216 SEL_{24h}	- -	Popper et al. 2014
	Mortality/potential mortality	219 dB SEL_{24h}	-	
Fish: Swim bladder + fish eggs and larvae	Recoverable	207 dB PK 203 dB SEL_{24h}	0.04 0.04	
Fish: Swim bladder – not involved in hearing) + fish eggs and larvae	Mortality/Potential mortality	210 SEL_{24h}	-	
Fish: Swim bladder – involved in hearing)	Mortality / Potential mortality	207 dB SEL_{24h}	0.03	
Fish: With or without swim bladder	TTS	186 dB SEL_{24h}	0.43	
Marine Turtles	Behavioural disturbance	175 dB SPL	0.37	McCauley et al. 2000
	Behavioural response	166 dB SPL	0.92	McCauley et al. 2000
	PTS	232 dB PK 204 dB SEL_{24h}	- 0.03	Finneran et al. 2017
	TTS	226 dB PK 189 dB SEL_{24h}	- 0.27	
Marine Mammals	Behavioural	140 dB SPL 160 dB SPL	5.43 1.50	Wood et al. 2012 NOAA 2019
Low-frequency cetaceans: (humpback and pygmy blue whales)	PTS	219 dB PK 183 dB SEL_{24h}	- 0.33	Southall et al. 2019
	TTS	213 dB PK 168 dB SEL_{24h}	- 1.50	
High-frequency cetaceans: (dolphins, beaked whales, sperm whales)	PTS	230 dB PK 185 dB SEL_{24h}	- -	
	TTS	224 dB PK 170 dB SEL_{24h}	- -	
Very high-frequency cetaceans: (pygmy and dwarf sperm whales)	PTS	202 dB PK 155 dB SEL_{24h}	0.06 -	
	TTS	196 dB PK 140 dB SEL_{24h}	0.25 0.08	
Otariid Pinnipeds	PTS	232 dB PK 203 dB SEL_{24h}	- -	
	TTS	226 dB PK 188 dB SEL_{24h}	- -	

A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).
An asterisk indicates that the sound level was not reached at any location within the operational areas. Noting

this excludes modelling conducted at Julpha, which is in water depths of 45m and was removed from the VIC/P79 operational area in August 2023.

6.7.2.6. VSP - Furthest Modelling Distances for All Areas

The criteria and maximum (worst-case) effect distances (from all locations within each of the three permits T/49P and VIC/P79 operational areas, to the potential sound impacts identified for VSP scenarios are summarised in Table 6-35.

Table 6-35: Effect criteria and worst-case results for repetitive single pulse sites (dB PK) and accumulated SEL scenarios (dB SEL24h) for VSP from all locations

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Modelled Scenario
Invertebrates	Effects at seafloor	213 dB PK	*	
		212 dB PK	*	
		210 dB PK	*	
		209 dB PK	*	
	No effects at seafloor	202 dB PK	0.170	VIC/P79-South
Fish: No swim bladder	Recoverable	213 dB PK 216 SEL_{24h}	- -	N/A
	Mortality/potential mortality	219 dB SEL_{24h}	-	N/A
Fish: Swim bladder + fish eggs and larvae	Recoverable	207 dB PK 203 dB SEL_{24h}	0.05 0.04	T/49P and VIC/P79-Northern extent
Fish: Swim bladder – not involved in hearing) + fish eggs and larvae	Mortality/Potential mortality	210 SEL_{24h}	-	N/A
Fish: Swim bladder – involved in hearing)	Mortality / Potential mortality	207 dB SEL_{24h}	0.03	T/49P and VIC/P79-North
Fish: With or without swim bladder	TTS	186 dB SEL_{24h}	0.45	VIC/P79-South
Marine Turtles	Behavioural disturbance	175 dB SPL	0.37	T/49P and VIC/P79-North
	Behavioural response	166 dB SPL	0.92	T/49P and VIC/P79-North
	PTS	232 dB PK 204 dB SEL_{24h}	- 0.03	T/49P, VIC/P79-South and VIC/P79-North
	TTS	226 dB PK 189 dB SEL_{24h}	- 0.27	T/49P and VIC/P79-North
Marine Mammals	Behavioural	140 dB SPL 160 dB SPL	6.48 1.50	VIC/P79-South T/49P and VIC/P79-North
Low-frequency cetaceans: (humpback and pygmy blue whales)	PTS	219 dB PK 183 dB SEL_{24h}	- 0.33	T/49P and VIC/P79-North
	TTS	213 dB PK 168 dB SEL_{24h}	- 2.39	VIC/P79-South
High-frequency cetaceans: (dolphins, beaked whales, sperm whales)	PTS	230 dB PK 185 dB SEL_{24h}	- -	
	TTS	224 dB PK 170 dB SEL_{24h}	- -	

Receptor	Impact	Noise Effect Criteria	Maximum distance (km)	Modelled Scenario
Very high-frequency cetaceans: (pygmy and dwarf sperm whales)	PTS	202 dB PK 155 dB SEL_{24h}	0.06 -	T/49P, VIC/P79-South and VIC/P79-North
	TTS	196 dB PK 140 dB SEL_{24h}	0.25 0.08	T/49P and VIC/P79-North
Otariid Pinnipeds	PTS	232 dB PK 203 dB SEL_{24h}	- -	
	TTS	226 dB PK 188 dB SEL_{24h}	- -	

A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).
An asterisk indicates that the sound level was not reached.

6.7.3. Environmental Impacts

Underwater impulsive sound emissions have the potential to result in a change in ambient sound.

A change in ambient sound has the potential to result in impacts to receptors, including:

- Change in fauna behaviour, including stress responses (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 37)
- Injury/mortality (barotrauma) to fauna, including:
    - Mortality, including injury leading to death
    - Auditory impairment
    - Permanent threshold shift (PTS), and
    - Temporary threshold shift (TTS)

6.7.4. Defining the Environment that May Be Affected (EMBA)

Certain groups of marine receptors have been identified to perceive and be affected by sound in similar ways. Sound exposure threshold criteria have been developed to account for differing impact levels (e.g. different threshold criteria for PTS, TTS and behavioural disturbance), and for variability between groups (e.g. different threshold criteria for marine mammals and fish).

When defining the environment that may be affected (EMBA) by impulsive sound emissions, EMBAs are identified and evaluated for each threshold criteria relevant to each receptor group. Throughout the consequence evaluation, modelling results are used to describe specific consequences to individual receptor groups within each of the relevant EMBAs.

Table 6-36 describes the basis for defining the EMBAs for impulsive sound emissions, including relevant sources of information and resultant spatial extent.

Table 6-36: Defining the EMBAs for Impulsive sound emissions

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
SPB Impulsive Sound Emissions	500 m EMBA for injury and behavioural disturbance	Conservative distance which includes the maximum spatial extent of impacts to: - Cetaceans (Injury – TTS), and - Southern right whales (behavioural disturbance).	Underwater sound modelling (Appendix G)	**500 m** around activities (assessed as 2km around operational areas)
VSP Impulsive Sound Emissions	2 km EMBA for injury	Conservative distance which includes the maximum spatial extent of impacts to: - Marine invertebrate (no effects) - Fish, fish eggs and larvae (recoverable, mortality and TTS)	Underwater sound modelling (Appendix G)	**2 km** around activities (assessed as 2km around

		- Marine turtles (behaviour, PTS and TTS) - Marine mammals (behaviour)		operational areas)
	2.5 km EMBA for Injury to Marine Mammals	Conservative distance which includes the maximum spatial extent of impacts to: - Cetaceans (TTS and PTS).	Underwater sound modelling (Appendix G)	**2.5 km** around activities (assessed as 2.5 km around operational areas)
	6.5 km EMBA for behavioural disturbance to SRW cow-calf pairs	Conservative distance which includes the maximum spatial extent of behavioural disturbance to: - Southern right whale cow-calf pairs.	Underwater sound modelling (Appendix G)	**6.5 km** around activities (assessed as 6.5 km around operational areas)
	1.5 km EMBA for behavioural disturbance to all other whales	Conservative distance which includes the maximum spatial extent of behavioural disturbance to: - All other whales.	Underwater sound modelling (Appendix G)	**1.5 km** around activities

6.7.5. Identifying Sound-sensitive Receptors

ConocoPhillips Australia considers the values and sensitivities relevant to the assessment of impacts associated with underwater sound, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

Impulsive underwater sound emissions may impact the following biological receptors:

- Marine invertebrates (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 278, 280, 309, 338)
- Fish (with and without swim bladders) including eels, sharks, fish eggs and larvae
- Marine turtles, and
- Marine mammals (e.g. pinnipeds and cetaceans).

The EPBC Act PMST Report for the largest effect distance for invertebrate species (Appendix B; 2 km EMBA) did not identify any threatened marine invertebrate species.

For VSP, the EPBC Act PMST Report for the largest effect distance for fish species (Appendix B) identified 35 fish species, which may occur within the 2 km EMBA for injury to fish (conservatively assessed as 2 km around the operational areas). Of these, seven have an EPBC threatened status, with two listed as Vulnerable (white shark (*Carcharodon carcharias*) and Australian grayling (*Prototroctes maraena*)), and five listed as Conservation Dependent (blue warehou (*Seriolella brama*), southern bluefin tuna (*Thunnus maccoyii*), deep-orange roughy (*Hoplostethus atlanticus*), southern dogfish (*Centrophorus zeehaani*), and eastern school shark (*Galeorhinus galeus*)). Fish are not predicted to be affected by SBP activities.

For VSP, the EPBC Act PMST Report for the largest effect distance for marine turtles (Appendix B) identified three marine turtles which may occur within 2 km EMBA for behaviour, PTS or TTS to marine turtles (conservatively assessed as 2 km around the operational areas). All species have EPBC threatened status', with two listed as Endangered (loggerhead (*Caretta caretta*) and leatherback (*Dermochelys coriacea*)) and one listed as Vulnerable (green (*Chelonia mydas*)). Marine turtles are not predicted to be affected by SBP activities.

For VSP, the EPBC Act PMST Report for the largest effect distance for marine mammals (Appendix B) identified 28 marine mammals which may occur within the 2.5 km EMBA for injury (conservatively assessed as 2.5 km around the operational areas). Of these, four species have EPBC threatened status, with two listed as Endangered (southern right whale (*Eubalaena australis*), and blue whale (*Balaenoptera musculus*)), and two as Vulnerable (sei Whale (*Balaenoptera borealis*), and (fin whale (*Balaenoptera physalus*)). Marine mammals are not predicted to be affected by SBP activities unless within 10s of metres of the source.

For VSP, the EPBC Act PMST Report for the largest effect distance (Appendix B) identified the southern right whale (*Eubalaena australis*), with an EPBC threatened status listed as Endangered, to occur within the 6.5 km EMBA for behavioural disturbance. For SBP, the largest effect distance is 130 m of the source and impacts are not predicted.

During consultation NRE Tasmania advised that the impact of acoustic disturbance should be considered to species including the shy albatross, and to breeding colonies of short-tailed shearwaters and little penguins present on the west coast of King Island, such as the avoidance of key foraging habitats during the breeding season (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 53). Consequently, bird species that may be affected by an increase in ambient underwater sound from exploration activities and have also been evaluated despite the lack of threshold data.

Conservation values and sensitivities such as marine protected reserves, socio-economic receptors, such as commercial fisheries, and the cultural environment may be affected by an increase in ambient underwater sound from exploration activities and have also been evaluated.

6.7.6. Consequence Evaluation

6.7.6.1. Ecological Receptors

Marine Invertebrates

Despite there being several comprehensive reviews of impulsive noise impacts to invertebrates (Carroll *et al*. 2017; Edmonds *et al*. 2016) no defined effect criteria have been established. As a result, the outcomes from studies on the acoustic impacts of seismic exposure on the southern rock lobster (*Jasus Edwaqrdsii*) (Day et al. 2016) and scallop (*Pecten fumatus*) (Day et al. 2019) are typically used.

Day et al. (2016b) observed sub-lethal effects (e.g. impairment to reflexes, damage to statocysts and reduction in number of haemocytes) after exposure to measured received sounds levels of peak-peak pressure: 209–212 dB re 1 µPa. Day et al. (2019) observed similar effects to scallops after exposure to measured received sounds levels of peak-peak pressure: 213 dB re 1 µPa. Payne et al. (2007) found no effects to the American lobster (*Homarus americanus*) in righting time or haemolymph biochemistry but a possible reduction in calcium after exposure to received noise levels of 202 dB re 1 µPa (PK-PK).

Table 6-35 details that underwater impulsive sound from both SBP and VSP activities are not predicted to reach the effect criteria for invertebrates at the seafloor. The maximum distance to the no effect criteria at the seafloor was reached at 170 m. Therefore, within water depths < 170 m, marine invertebrates directly below the impulsive sound source are likely to detect a change in ambient sound; however, **Negligible (1)** consequences are predicted (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 278, 280, 309, 338).

Based on the modelling, impacts to marine invertebrates from SBP and VSP activities, such as injury/mortality as described above, is not predicted. Subsequently, impacts to commercial fisheries which target marine invertebrates, such as the rock lobster and giant crab species, are not predicted.

Fish

Hearing ranges and sensitivity varies considerably among fish species. Noise effect criteria for fish including eels, are based on the presence of a swim bladder. Fish with swim bladders generally have lower sound pressure thresholds and wider frequency ranges of hearing (Popper et al. 2014). Typically, site-attached and demersal fish have a swim bladder, whereas pelagic fish do not. As noise effect criteria for sharks does not currently exist, they are assessed as fish without swim bladders. [Paragraph updated in response Matter: F10].

The American National Standards Institute (ANSI) accredited report of sound exposure guidelines for fishes and sea turtles (Popper et al. 2014) defines three types of immediate effects to fish from underwater sound emissions: mortality (including injury leading to death), recoverable injury (including injuries unlikely to result in mortality, such as hair cell damage, masking and minor haematoma), and TTS (such as a reduction in hearing).

Acoustic mapping of pelagic fish distribution and abundance immediately prior to and after a seismic survey off the Norwegian coast found that this noise source had insignificant short-term scaring effects, with vertical movement indicated as a short-term reaction for some pelagic species (Slotte et al. 2004). Given that seabed surveys (1-week per location) and VSP (20 hours per well for a maximum of 6 wells) are short-term, temporary and emit lower levels of underwater sound compared to a seismic survey, behavioural disturbance is not predicted to affect catchability or the migration of pelagic species.

Table 6-35 details the noise effect criteria from Popper et al. (2014) and the distances at which modelling estimated they could be reached for both fish with and without a swim bladder during VSP. In summary, for VSP:

- The noise effect criteria for mortality/potential mortal injury was predicted for fish with a swim bladder (involved in hearing) at a maximum distance of 30 m and for fish without a swim bladder the criteria was not reached.
- The noise effect criteria for recoverable injury was predicted for fish with a swim bladder at a maximum distance of 40 m and fish without a swim bladder the criteria was not reached.
- The noise effect criteria for TTS for fish with and without a swim bladder was predicted at a maximum distance of 450 m.

Studies to date have not shown mortality in relation to potential impact to fish from impulsive noise, though prolonged or extreme exposure to high-intensity, low-frequency sound, may lead to physical damage such as threshold shifts in hearing or barotraumatic ruptures (Carroll et al. 2017). Based on the modelling, and that SBP and VSP will not result in prolonged or extreme exposure to fish, it is unlikely that injury impacts to fish would occur.

A study conducted on anguilliform fish, such as eels, under experimental conditions found that the introduction of acoustic stimuli influenced the behaviour (i.e. increased swimming speeds, movements away from ensonified walls) of the river lamprey (Lampetra fluviatilis) and the European eel (Anguilla) but did not influence route selection and therefore didn't influence movements of either species (Deleau et al. 2019). It was stated that the observed responses would likely be insufficient to induce a strong deterrent effect in the field if used in isolation (Deleau et al. 2019). [Paragraph added in response to Matter: F10].

Furthermore, the operational area does not overlap any areas where site-attached fish species are likely to be present (see Section 4.6.1.1), therefore it would be expected that any impacts to fish, including eels and sharks, would be limited to behavioural impacts such as startle response or avoidance behaviour.

Thus, behavioural impacts to fish would be temporary and with a **Negligible (1)** consequence on individuals or at a population level.

Birds

Impulsive underwater sound emissions have the potential to result in a change in ambient sound. As a result of a change in ambient sound, further impacts may occur to birds, including a change in behaviour, hearing capacity and physical condition. There are no thresholds for underwater sound impacts to birds. As such, no modelling can be conducted. The threshold for physiological damage on the auditory system for birds is unknown.

Southall et al. (2019) recommended using guidance for other carnivores in water (OCW) as a proxy. Using OCW thresholds the noise effect criteria for permanent threshold shift (PTS) and temporary threshold shift (TTS) were not reached, therefore any predicted impacts would be limited to behavioural response such as avoidance of highly localised areas while SBP and VSP are undertaken. [Paragraph added in response to Matter: B06].

Most seabirds are generally shallow divers and utilise surface waters where the acoustic signals ‘destructively interfere’ with the sea surface, resulting in much lower sound exposure compared with deeper waters (Marine Technology Directorate, 1996: cited in SCAR, 2002) and the time of exposure underwater is short. If individual birds or flocks are present in the Operational Areas during activities, vessel movement is expected to temporarily deter them from foraging in the immediate vicinity of the vessel or drilling rig. The uncertainty of underwater sound impacting individuals or a population of any given species during plunge/dive feeding is extremely low. While resting/rafting on the water surface, there is limited potential for seabirds to be affected by the underwater sound due to the limited transmission of sound between the air-water interface. If there is an effect, it is likely to be a startle response, resulting in the bird flying away.

Seabirds feed on multiple prey species and have widespread foraging areas. Indirect impacts including displacement of prey species such as fish will be limited to the close proximity of the impulsive sound sources (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 52). The maximum TTS criteria for fish from VSP was reached within 450 m of the source. While displacement of some prey species may result in the displacement of these birds, this impact is localised, temporary and recoverable in any one location. Given their widespread foraging areas (ACAP 2018) and the small area possibly affected by prey displacement, seabirds are not expected to be impacted by reduced net foraging opportunities. Impacts to shorebird species are not predicted from the activity, given their prey is concentrated within the intertidal zone along the coastline.

The little penguin is capable of diving to 72 m but typically dives to 10-20 m. During the non-breeding season this species is known to participate in single-day or multiple-day foraging trips, primarily in coastal waters. A study conducted by McCutcheon et al. found approximately 3/4 of individuals partaking in single-day trips where foraging occurred between 8-14 km from the colony, while the remaining quarter underwent multiple day trips to maximum distance of 62-147 km from the colony (McCutcheon et al 2011). During the breeding season (October to December) this species is expected to remain closer, within 15 km, to their colonies (Australian Wildlife, 2014).

The closest little penguin foraging Biological Important Area (BIA – where species are known or likely to display important behaviours such as foraging) to the operational areas is situated >20 km from

T/49P. Whilst the presence of little penguins within operational areas is possible, encounter rates are expected to be low and impacts from impulsive underwater sound emissions are considered Negligible (1). Further, it is inferred that penguins have relatively poor hearing thresholds in the lower frequencies (McCauley, 1994). If foraging individuals are encountered within the sound EMBA they are expected to exhibit avoidance behaviours and move away from the noise source. However, due to the short-term, temporary nature of the proposed activities penguins are expected to return quickly to the location. [Paragraph updated in response to Matter: B03].

Pichegru et al. 2017; Bronti 1985, state that penguins are highly vocal species that have been recorded to emit vocalisations at the sea surface, a behaviour possibly associated with group formation and group foraging, and suggest that it is likely they also communicate socially underwater. However, no evidence is provided. A more recent study assessed the emission of vocalisations underwater by three species of penguin (Thiebault et al. 2019). A total of 203 underwater vocalisations were emitted, 50% of which were directly linked to foraging behaviours. However, there was no recorded underwater vocalisations concomitantly to synchronised diving activity (even when such activity was recorded) it is therefore unlikely that these vocalisations could have been used to coordinate feeding activities. Thiebault et al. (2019) concluded the function of vocalisations to be speculative and they were unable to demonstrate the significance of the behaviour. Although this study provides first evidence of underwater vocalisations in penguin species, as previously detailed penguins species are anticipated to exhibit avoidance to impulsive sound sources (Pichegru et al. 2017). [Paragraph added in response to Matter: B03].

As little penguins typically participate in coastal foraging trips within 8-14 km of their colonies (McCutcheon et al. 2011) and considering colonies are located approximately 20 km or more from the operational areas, impacts to the little penguin from impulsive underwater sound emissions are not predicted (Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 2690, FB ID: 143, 155; Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 3860; FB ID: 154).

The consequence is assessed as **Negligible (1)** as there are no identified noise thresholds identified for birds.

Marine Turtles

The Recovery Plan for Marine Turtles in Australia (CoA 2017) identifies noise interference as a threat to turtles, however, only exposure to chronic (continuous) loud noise within the marine environment is identified as a noise source which may lead to avoidance of important habitat. Impulsive sounds, as evaluated in this chapter, were not specified.

For acute, or impulsive, underwater sound, there is little information pertaining to the impacts on marine turtles. McCauley et al. (2000) reported that exposure to air gun shots that replicate seismic surveys caused green and loggerhead turtles' behaviour to become more erratic at 175 dB re1 µPa rms (behavioural disturbance), but that turtles may show behavioural responses to an approaching seismic noise at received sound levels of approximately 166 dB re1 µPa rms. There are no published data regarding TTS or PTS in marine turtles exposed to impulsive noise sources, as such Finneran et al (2017) adapted the threshold to match the highest marine mammal values.

Given that the impacts of impulsive noise are unknown, a precautionary approach has been taken regarding assignation of possible consequences. Table 6-35 details the noise effect criteria from McCauley et al. (2000) and Finneran (2017) and the distances at which modelling estimated they could be reached for marine turtles for VSP. In summary, for VSP:

- The noise criteria effect for behavioural disturbance was predicted at a maximum distance of 370 m.

- The noise criteria effect for behavioural response was predicted at a maximum distance of 920 m.
- The noise criteria effect for PTS was reached was predicted at a maximum distance of 30 m.
- The noise criteria effect for TTS was reached was predicted at a maximum distance of 270 m.

The EPBC Act PMST report (Appendix B) identified three marine turtle species which may occur within the 2 km VSP EMBA for Injury of marine turtles, though no BIAs or habitat critical to the survival of the species were identified.

The consequence severity of impulsive underwater sound on marine turtles is assessed as **Minor (2)** based on:

- The conservative approach taken in the sound modelling and the use of the furthest distance to the PTS, TTS and behaviour response and disturbance criteria being used to assess potential impacts.
- No threshold criteria were reached for SBP activities.
- The Recovery Plan for Marine Turtles in Australia (CoA 2017) details that exposure to chronic (continuous) loud noise in the marine environment may lead to avoidance of important habitat. Given the short duration of the VSP operations (< 20 hours), any impacts are expected to be temporarily and localised.
- No biologically important behaviours, BIAs, or habitat critical to survival for marine turtles were identified within the 2 km VSP EMBA for behavioural effects.
- Marine turtle behavioural disturbance and behavioural response thresholds identified by McCauley et al. (2000) were reached for VSP. However it is unlikely that marine turtles will remain within the largest distance (370 m) for onset to occur.
- Marine turtle PTS and TTS thresholds identified by Finneran et al. (2017) were reached for VSP. However, it is unlikely that a marine turtles will remain in the largest distance (270 m TTS) for long enough for onset to occur.
- The numbers of turtles expected to occur within the operational area is low, therefore, any potential impacts are not anticipated to impact population level.
- The adopted control measures including soft-starts for VSP detailed in Table 6-37, will further reduce the potential for impacts to these species.

Otariid Seals

During consultation, the environmental values and sensitivities of Deen Maar (Lady Julia Percy Island, Victoria), were identified including the presence of breeding colonies of Australian and New Zealand fur-seals (Org ID: 597, Event ID: 1144, FB ID: 32, 33). The EPBC Act PMST Report (Appendix B) identified three species of pinnipeds which may occur within the 2 km EMBA for injury to marine mammals, being the New Zealand fur-seal, the Australian fur-seal and the Australian Sea-lion. No BIAs or habitat critical to the survival of the species were identified. The Conservation Advice for the Australian Sea-lion *Neophoca cinerea* (TSSC 2020c) lists impulsive noise emissions as a potential threat to the Australia Sea-lion. Further, Reid Rocks is located approximately 52 km from the closets point of the T/49P operational area and is outside of the sound EMBA for behavioural effect distance for marine mammals, including pinnipeds, of 22.8 km for off-shelf locations. [Paragraph updated in response to Matter: M27].

The noise effect criteria for PTS and TTS for Otariid seals was not reached, therefore any predicted impacts would be limited to behavioural response such as avoidance of highly localised areas while SBP and VSP are undertaken (Table 6-35).

The consequence severity of impulsive underwater sound on Otariid seals is assessed as **Minor (2)** based on:

- Predicted impacts are limited to behavioural response, such as avoidance of the area whilst SBP and VSP operations are being undertaken, as PTS and TTS threshold were not reached.
- Impacts are predicted to be temporary and localised given the small area of potential behavioural impact (130 m for SBP and 1.5 km for VSP), and the infrequent and short duration of seabed surveys (1 week per location) and VSP operations (< 20 hours per well, for a maximum of 6 wells).
- No BIAs or habitat critical to the survival of the species were identified.

Very High Frequency Cetaceans

The furthest distance to the very high frequency (VHF) cetacean PTS criteria is 60 m and to the TTS criteria is 250 m. The distances to the behavioural threshold predicted for VSP operations was 1.5 km for marine mammals. The PMST Report for the largest conservative threshold distance (Appendix B; 2 km EMBA) identified that VHF cetaceans such as pygmy sperm whale (*Kogia breviceps*) and dwarf sperm whale (*Kogia sima*) may occur within the Sound Injury EMBA (2 km), however, no biologically important areas or behaviours were identified within the area of ensonification.

Given the infrequent and short duration of the seabed surveys (1 week per location), and the very limited spatial area (up to 130 m) of exposure to impulsive sounds above behavioural thresholds, any impacts are expected to be localised and short-term.

Given the infrequent and short duration of the VSP operations (< 20 hours), and the very limited spatial area (up to 1.5 km) of exposure to impulsive sounds above behavioural thresholds, any impacts are expected to be localised and short-term.

The consequence severity of impulsive underwater sound on VHF cetaceans is assessed as **Negligible (1)** and for the based on:

- Impacts to VHF cetaceans are likely to be limited to behavioural response, such as avoidance of the area whilst seabed surveys and VSP operations are being undertaken, due to the small area of impacts predicted for PTS and TTS.
- Impacts are predicted to be temporary and localised given the small area of potential behavioural impact (130 m to 1.5 km), and the infrequent and short duration of the activities.
- No BIAs or habitat critical to the survival of the species were identified.

High Frequency Cetaceans

The noise effect criteria for PTS and TTS for high frequency (HF) cetaceans was not reached, therefore any predicted impacts would be limited to behavioural response such as avoidance of the area while seabed surveys and VSP are undertaken (Table 6-35). The PMST Report (Appendix B; 2 km EMBA for injury to marine mammals during VSP) identified HF cetaceans such as several dolphin species (e.g. bottlenose dolphin (*Tursiops truncatus s. str.*) and dusky (*Lagenorhynchus obscurus*)), and beaked whales (e.g. *Mesoplodon bowdoini, Berardius arnuxii*, and *Ziphius cavirostris*) may occur within the 2 km EMBA. However, no biologically important areas or behaviours were identified within the area of ensonification.

Given the infrequent and short duration of the seabed surveys (1 week per location), and the very limited spatial area (up to 130 m) of exposure to impulsive sounds above behavioural thresholds, any impacts are expected to be localised and short-term.

Given the infrequent and short duration (< 20 hours) of the VSP operations, and the very limited spatial area (up to 1.5 km) of exposure to impulsive sounds above behavioural thresholds, behavioural impacts are predicted to be temporary avoidance for the short duration of the activity.

The consequence severity of impulsive underwater sound on HF cetaceans is assessed as **Negligible (1)** there are no biologically important behaviours or biologically important areas identified within the predicted ensonified area.

Low Frequency Cetaceans

For SBP, PTS and TTS criteria are not reached for low-frequency (LF) cetacean. The distance to the behavioural threshold predicted for SBP operations was 130 m for southern right whales.

For VSP, the furthest distance to the LF cetacean PTS criteria is 330 m and the TTS criteria is 2.39 km. The distances to the behavioural threshold predicted for VSP operations was 1.5 km for marine mammals and 6.48 km for southern right whale cow-calf pairs. The PMST Report (Appendix B; Sound Injury EMBA 2 km) identified several LF cetaceans which may occur within the Sound Injury EMBA (2 km). Foraging behaviours were identified for several species including sei, fin, blue, and pygmy right (*Caperea marginata*) whales and the migration BIA for the southern right whales (see Sound Injury EMBA PMST Reports (Appendix B) and Section 4.6.9.2)).

The Conservation Management Plan (CMP) for the Blue Whale (DoE 2015) specifies high intensity signals with high peak pressures received at very short range, such as impulsive noise from VSP, as a threat to the species.

The Conservation Management Plan (CMP) for the Southern Right Whale (DSEWPaC 2012b) identifies loud noises and long exposures which may lead to avoidance of important habitat areas, interruption to communication and, in some situations, physical damage, including permanent or temporary hearing loss as a threat.

Auditory masking impacts may occur when underwater sound interferes with the ability of marine mammals to detect natural sounds. The noise must be loud enough and have a similar frequency to the signal and both signal and noise must occur at the same time. This may interfere with animals' communication and socialisation, the detection of predators and prey, and navigation and orientation. There is little information available regarding auditory masking in whales (Richardson et al. 1995), although it has been suggested that an observed lengthening of calls in response to low-frequency noise in humpback whales and orcas may be a response to auditory masking (Fristrup et al. 2003; Foote et al. 2004).

The magnitude of impacts (≤50 m for recoverable injury from the VSP source) on prey species is highly localised and is not expected to be discernible at the regional scale when considering the large natural spatial and temporal variability and scale of plankton and spawning biomass in the South-east Marine Region. Furthermore, impacts to predator/ prey interactions are highly unlikely, given the short duration of VSP (≤20 hours per well for a maximum of 6 wells). The potential impacts of impulsive noise emissions from VSP on zooplankton are considered to be localised and short-term, with the activity not likely to result in any ecologically significant impacts at a population level for any zooplankton, fish eggs or larvae, other prey species that may be present in the water column within or adjacent to the Operational Area.

The inherent consequence severity of impulsive underwater sound from SBP and VSP activities on LF cetaceans is assessed as **Moderate (3)** and for the based on:

- The conservative approach taken in the sound modelling and the use of the furthest distance to the PTS, TTS and behaviour impact criteria being used to assess potential impacts.
- Given the infrequent and short duration of the seabed surveys (1 week per location), and the very limited spatial area (up to 130 m) of exposure to impulsive sounds above behavioural thresholds, any impacts are expected to be localised and short-term.

- Given the infrequent and short duration (< 20 hours per well for a maximum of 6 wells) of the VSP operations, and the very limited spatial area of exposure to impulsive sounds above TTS and behavioural thresholds, behavioural impacts are predicted to be temporary avoidance for the short duration of the activity.
- The seabed survey and VSP operations will be managed to ensure that they are consistent with the CMPs for the blue whale and southern right whale.
- The CMP for the Blue Whale (DoE 2015) assesses the impacts of shipping and industrial noise, which includes impulsive noise, on the species as 'Minor' i.e., 'individuals are affected but no affect at population level'.
- For VSP, the largest area of impact for the maximum behavioural threshold for pygmy blue whales is very small, calculated from the furthest distance of 1.5 km, an area of 7 km^2, which equates to approximately 0.02% of the pygmy blue whale high annual use foraging BIA (35,627 km^2), thus displacement from the foraging grounds is unlikely. For SBP the area is even smaller representing 0.00006% of the high annual use BIA.
- For VSP, the largest area of impact for the maximum TTS threshold for pygmy blue whales is very small, calculated from the furthest distance of 2.39 km, an area of 17.95 km^2, which equates to approximately 0.05% of the pygmy blue whale high annual use foraging BIA (35,627 km^2).
- The CMP for the Southern Right Whale (DSEWPaC 2012b) assesses the impacts of acute industrial noise, which includes impulsive noise, as a 'Minor' i.e. 'individuals are affected but no affect at population level'.
- During consultation, the Bass Strait was identified as a migratory route for southern right whales (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41, 44). Whilst under the Tasmanian Threatened Species Protection Act 1995 the southern right whale is listed as Endangered there is no state conservation management plan detailing threats to the species. The NRE Tasmania Conservation site (NRE Tasmania 2023) refers to the Commonwealth Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b).
- For VSP, the largest area of impact for the maximum behavioural threshold for southern right whales is very small, calculated from the furthest distance of 6.48 km, an area of 132.32 km^2, which equates to approximately 0.005% of the southern right whale migration BIA (2,441,611 km^2); hence displacement is not expected to impact the whale population present within the region. For SBP the area is even smaller representing considerably less than 0.001% of the migration BIA.
- As TTS and behavioural thresholds for southern right whales overlap the migration BIA additional control measures have been adopted to reduce possible TTS and behavioural impacts.
- No biologically important areas were identified for dwarf minke, fin, sei or pygmy right whales within the largest impulsive sound EMBAs.
- The conservation advice for fin whales (TSSC 2015d) and sei whales (TSSC 2015c) both list 'anthropogenic noise and acoustic disturbance' as a threat to the species, with a consequence rating as 'minor' with the extent over which the threat may operate as 'moderate-large'.
- Pygmy right whale are not listed within the EPBC Act threatened list, therefore, there is no conservation advice that identifies anthropogenic sound as a threat.
- During consultation the Bass Strait was identified as a migratory route for humpback whales and dwarf minke whales (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41, 44). Whilst under the Tasmanian *Threatened Species Protection Act 1995* the humpback is listed as endangered there is no state conservation management plan detailing threats to the species. The NRE Tasmania Conservation site (NRE Tasmania 2023) refers to the Commonwealth Conservation Advice for the Humpback Whale. Whilst Commonwealth listing advice for the humpback whale states the species is no longer listed as Vulnerable it still lists noise from drilling and shipping activities as a threat. However, due to the short duration of drilling and supporting vessel activities individuals may be affected

but there will be no affect at a population level. The dwarf minke whales is not listed as threatened species under the Tasmanian *Threatened Species Protection Act 1995 or the EPBC Act*, and there is no conservation advice that identifies anthropogenic sound as a threat. Due to the short duration of drilling and supporting vessel activities it is predicted that, although individuals may be affected, there will be no affect at a population level.

- The adopted control measures, detailed in Section 6.7.7 will effectively mitigate PTS, TTS and behavioural impacts to cetaceans undertaking biologically important behaviours within the area during exploration activities.

6.7.6.2. Conservation Values and Sensitivities

For both SBP and VSP, impulsive sound EMBAs overlap a small area of the Zeehan Commonwealth Marine Reserve (Special Purpose Zone and Multiple Use Zone – IUCN Category VI), and Apollo Commonwealth Marine Reserve (Multiple Use Zone – IUCN Category VI). The South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) details noise pollution associated with shipping, other vessels, seismic survey, offshore mining operations and offshore construction as a pressure on the conservation values of the South-east Marine Reserve Network within (DNP 2013).

As described within Section 4.4.1.1 the conservation values for the Apollo Marine Reserve include benthic habitats and communities, cultural and heritage sites, and ecological receptors, such as pinnipeds, cetaceans, seabirds (DNP 2013). The Zeehan Marine Reserve conservation values include seafloor habitats, cetaceans and seabirds (DNP 2013).

For VSP, the furthest noise criteria distance was identified to overlap a small area of the West Tasmania Canyon, a key ecological feature identified for the South-east Marine Region, located on the edge of the continental shelf offshore of the north-west corner of Tasmania (DoE 2015b). As described in Section 4.4.9.2 these canyons are associated with upwellings and high productivity. Sponges are concentrated near the canyon heads, with the greatest diversity between 200 m and 350 m depth. This high productivity area is associated with abundance of fishes, including fish nurseries (blue warehou and ocean perch), foraging seabirds (albatross and petrels), white shark and foraging blue and humpback whales.

The consequence severity of impulsive underwater sound on conservation values and sensitivities is assessed as **Minor (2)** and for the based on:

- Noise pollution associated with shipping, other vessels, seismic survey, offshore mining operations and offshore construction is listed as a pressure on the conservation values of the South-east Marine Reserve Network within the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).
- The impacts of underwater sound emissions on the conservation values (i.e. pinnipeds, cetaceans and fish) for the Apollo and Zeehan Commonwealth Marine Reserve, and the West Tasmania Canyon has already been assessed in Section 6.7.6.1; as such further evaluation here is not required.
- Underwater impulsive sound is not predicted to affect local ecosystem function, due to the localised and temporary nature of the activities. The noise emissions associated with SBP and VSP activities are not expected to have the intensity to cause physical injury unless fauna were in very close proximity (tens of metres) to the source.
- The National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e) does not identify underwater sound emissions as a threat. Seabirds, such as albatrosses and petrels, are not anticipated to remain within the area of impact (i.e the water column) for a long period of time for the onset of PTS, TTS or behavioural impacts; therefore, displacement or impacts are unlikely.

- The adopted control measures, detailed in Section 6.7.7 will reduce possible PTS, TTS and behavioural impacts to conservation values and sensitivities that may be sensitive to underwater sound emissions and present within the area during exploration activities.

6.7.6.3. Socio-economic Receptors

During consultation, feedback was provided regarding the impact of underwater sound on the catchability of fish in general, and pelagic species more specifically in the Eastern Tuna and Billfish Fishery (Org ID: 479, Event ID: 3821, FB ID: 415; Org ID: 401, Event ID: 3850, FB ID: 401; Org ID: 428, Event ID: 2500, FB ID: 242). Acoustic mapping of pelagic fish distribution and abundance immediately prior to and after a seismic survey off the Norwegian coast found that this noise source had insignificant short-term scaring effects, with vertical movement indicated as a short-term reaction for some pelagic species (Slotte et al. 2004). Given that seabed surveys (1-week per location) and VSP (20 hours per well for a maximum of 6 wells) are short-term, temporary and emit lower levels of underwater sound compared to a seismic survey, behavioural disturbance is not predicted to affect catchability or the migration of pelagic species.

In addition, during consultation it was reported that drilling operations can attract bait and pelagic fish, reducing the catch available for commercial fishers (Org ID: 550, Salty Dog Fishing Charters, Event ID: 1141, FB ID: 25). Popper et al (2014) found most fish species are expected to exhibit avoidance behaviours to sound emissions. The EPBC Act PMST report for fish (Appendix B; 2 km EMBA for injury to fish) did not identify any of the target fish species for the Commonwealth Southern and Eastern Scalefish and Shark Fishery.

Feedback received during public comment queried impacts to divers. Noise modelling conducted for the EP uses the human health assessment threshold for divers and swimmers of 145 dB re 1 µPa (Parvin 2005). Based on the Rmax value for VSP this threshold is reached at 6.01 km from the sound source. The current locations of the proposed drilling sites are not yet known. However, even if a drilling location was situated on the most northerly boundary of VIC/P79 operational area (which is closest to the Victorian coastline) the 145 dB re 1 µPa threshold will be approximately 11 km from the coast. In addition, due to the northern boundary being situated away from the Victorian coastline, the 145 dB re 1 µPa threshold would not be present in waters shallower than approximately 44 m. [Paragraph added in response to Matter: F16].

It should be noted that abalone typically occur nearshore on hard bottom marine habitats with the majority occurring between 5-10 m, however they can be found in depths up to 40 m (DPI 2024). Abalone diving operations are undertaken using surface-supplied breathing apparatus (SSBA) and under Australian Standard AS/NZS 2299.1:1999 which limits SSBA diving operations to 30 m depths. In addition, most diving agencies recommend a maximum depth limit of 40 m for recreational scuba divers. Therefore, depths where the human health assessment threshold for divers and swimmers can be reached occur beyond those used by both commercial and recreational divers.

Impacts associated with VSP and SBP during the seabed surveys are predicted to have **Negligible (1)** consequence on socio-economic receptors.

6.7.6.4. Cultural Environment

Impulsive sound emissions EMBA are located entirely in the offshore marine environment. As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the impulsive sound emissions EMBAs overlap Sea Country for the duration of the operations.

Changes to the physical environment, such as changes to ambient sound levels, are not specifically listed as an issue of concern in the Kooyang Sea Country Plan (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation 2004). However, environmental protection and the general health of Sea Country are considered a key issue. The Plan focuses on integration of First Nations peoples voices into the management and protection of the environment, and research needs to allow for effective on-going management and protection (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation 2004).

The evaluation of impacts to the ecological environment concludes a consequence of **Moderate (3)** to low frequency cetaceans, **Minor (2)** for marine reptiles and otariid seals, and **Negligible (1)** or no impact predicted for all other ecological receptors, including kooyang (eels). Based on this, no long-term or population level impacts are predicted to ecological receptors, and underwater sound emissions will be managed in a manner as to not impact on the recovery of pygmy blue whale and southern right whale, as per the CMPs (DoE 2015, DWESPaC 2012b).

Southern right whale, or 'koontapool' in native tongue, are recognised by First Nations people as Gunditjmara Ancestors. The areas identified as SRW BIAs are also recognised by the Gunditjmara as sacred birthing areas. These 'Koontapool Woorrkngan Yakeen' - Whale Birthing Dreaming Sites, located in specific bays east of the Hopkins River, Victoria, and back east along the coast, are known resting and feeding sites for southern right whales; safe havens for mothers and babies. These places on Country are directly related to 'Gunditjmara Neeyn' (midwives). Every year, locals gathered on 'Gunditjmara Sea Country' for the first public welcoming of 'koontapool' back to her traditional birthing waters.

The inherent consequence evaluation for southern right whales assessed potential impacts from impulsive sound emissions as **Moderate (3)**, based on the potential for behavioural impacts whilst undertaking biologically important behaviours. Implemented control measures (identified in Table 6-38) will limit the nature and scale of any impacts, reducing impacts to low frequency cetaceans (including SRW) to **Minor (2)** consequences in line with the requirements of the CMP, with no changes at a population level predicted.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by atmospheric emissions.

6.7.7. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context B** has been applied:

- Impacts are relatively well understood, and uncertainty has been managed through site specific modelling.
- Activities are common and well-practised.
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Additional control measures have been considered to ensure lower and higher-order impacts are managed to ALARP and acceptable levels.

Table 6-37: Control Measures and ALARP Assessment for Underwater Sound - Impulsive

Adopted Control Measures	
Control	**Source of good practice control measure**
CM02: Vessel and MODU Operating Procedures	All vessels and aircraft will adhere to the distances and vessel management practices of EPBC Regulations (Part 8 Division 8.1 interacting with cetaceans) and will implement an increased caution zone of 500 m between whales and vessels, to ensure cetaceans are not harmed during offshore activities.
CM08: Fauna Management Plan (WMP) (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 46)	**Marine fauna observers** (Org ID: 597, Event ID: 1144, FB ID: 35) • Dedicated MFOs with experience in whale observation, distance estimation and reporting, will undertake observations. • In addition, facility crew who act as Officer of the Watch will receive training from the MFO in whale observation and distance estimation to assist the MMO during daylight hours. • For activities greater than 5 consecutive days at sea with >12 hours daylight, an additional dedicated MFO trained in whale observation, distance estimation and reporting will support the experienced MFO. As part of the activity induction all vessel and MODU crew will receive information on the EP controls and the importance of reporting whale sightings to the vessel MFO immediately.
	The Fauna Management Plan (Appendix N) outlines specific measures to minimise anthropogenic noise threats to relevant species, including the implementation of increased safe operating distances between vessels and whales, pre-activity surveys for specific activities, night-time and low visibility controls and establishment of safe points for operational activities in accordance with the Safety Case and Well Integrity requirements (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 46).
CM09: Drilling Program CM11: Procurement Vetting Process	VSP equipment will be operated in accordance with manufacturer's instructions and ongoing preventative maintenance to ensure efficient operation.
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347;Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).

Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Do not undertake the activities	Eliminate any potential impacts from anthropogenic underwater sound.	Given that DAWE assesses the potential impacts of shipping and industrial noise as 'minor' i.e., 'individuals are affected but no affect at population level' the potential environmental benefits of not undertaking the activity in relation to noise generation are also considered minor. ConocoPhillips Australia does not consider this control as feasible.	Reject
Do not undertake start-ups or operations at night-time or during low visibility conditions	Reduce probability of a cetacean occurring within the mitigation zone and not being detected.	Evaluation of trade-offs indicates the increased duration of seabed surveys and VSP testing and associated increased costs to meet survey/testing objectives would be grossly disproportionate to the benefit gained.	Reject
Substitution			

Heterodyne distributed vibration sensing (hDVS) technology	hDVS can result in reduction in time spent by the MODU on location undertaking VSP (and subsequent cost reduction), and reduction in the number of shots required for the activity, therefore decreasing marine fauna exposure time to underwater noise.	This technology may be feasible. However, availability cannot be guaranteed until the schedule is confirmed. Resource is limited as only one vender supplies this technology.	Reject
Reduction			
Implementation of soft starts for seabed surveys (SBP)	Soft starts (under EPBC Act Policy 2.1) are applied to seismic surveys to slowly ramp up the acoustic source to allow fauna to move away from the source, potentially reducing impacts.	The geophysical equipment being used for the seabed survey cannot be slowly ramped up. Therefore, this control measure is unfeasible and impossible to implement.	Reject
Implementation of soft starts (VSP)	Soft starts (under EPBC Act Policy 2.1) are applied to seismic surveys to slowly ramp up the acoustic source to allow fauna to move away from the source, potentially reducing impacts.	The VSP equipment can be slowly ramped up. Therefore, ConocoPhillips Australia considers this control measures feasible and effective to implement.	Adopt CM08: Fauna Management Plan
Avoid periods of marine fauna sensitivity (i.e. whale migration, foraging)	Reduce risk of impacts from noise emissions during environmentally sensitive periods for listed marine fauna.	High cost in moving or delaying activity schedule. The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. There is no ideal operational window in the Otway region. The costs associated with this control measure are grossly disproportionate given impacts to marine fauna will be localised and temporary; with the greatest spatial extent predicted at 1.5 km, and 6.48 km for potential behavioural disturbance to southern right whales for VSP, which is only undertaken for < 20 hours per well, for a maximum of 6 wells, and can be mitigated using existing control measures.	Reject
Mitigation			
Aerial surveillance prior-to/during VSP operations	Aircrafts or drones could provide a method of increasing the observation distance of MFOs.	Monitoring activities can effectively be carried out by MFOs situated on support vessels given the short effect distances and short durations for VSP. Costs, safety risks, and operational requirements considered grossly disproportionate to the marginal environmental benefit.	Reject
Dedicated monitoring support vessel (Pre-survey vessel surveillance (as per the EPBC Policy Statement 2.1 – Part B.2))	May increase ability to observe marine fauna within the area.	Monitoring activities can effectively be carried out by MFOs situated on the seabed survey or drilling support vessels. Evaluation of trade-offs indicates increased impacts associated with discharges, emissions and underwater sound,	Reject.

		increased risks from vessel collision, costs, safety risks and operational requirements are considered grossly disproportionate to the marginal environmental benefit for VSP and SBP.	
Verification of noise levels (as recommended in the Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) (2015))	Verify impulsive sound levels and allow implementation of adaptive management controls in the event that the impact is greater than expected.	Relatively short duration of VSP would prevent noise verification being completed before the activity is finished. The rapid reduction in noise levels from vessels and the low-level behavioural response expected from VSP and SBP.	Reject
Acoustic Monitoring (AM)	AM can be used to detect marine mammal calls, and support sightings made by MFOs. Currently available AM technologies are most useful in the detection of odontocetes known to emit regular distinctive clicks and high frequency calls during long dives. However – technology development specific to low frequency whale detections is currently underway in Australia. (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 48)	Historically, AM has had limited utility in detecting lower frequency calls of baleen whales (such as blue whales) especially when in the presence of constant background low frequency sound such as that generated by the MODU and vessel(s) towing the AM system. The cost of a AM system is high for a short-duration activity and would require a number of permanent moored systems or multiple ASVs/gliders around the operational area with real-time telemetry and analysis. Given the role of AM to inform mitigation decision making in low visibility and at night, and its ability to detect vocalisations over large distances, the cost and effort are not considered grossly disproportionate to the benefit gained as part of a multifaceted approach to whale detection.	Adopt CM08: Fauna Management Plan
Infra-red systems	Infra-red (IR) systems could enhance the ability of MFOs to visually detect the presence of whales.	Infra-red (IR) systems are limited in the distance ranges they can be used at making them of limited benefit over MFOs. Given the short duration of SBP and VSP activities, the associated low source levels, and the limited benefit beyond existing controls, the use of IR systems is considered grossly disproportionate to the benefit gained.	Reject

Residual Impact Consequence Ratings	
Invertebrates	**Negligible (1)**
Fish (including eels, sharks and rays)	**Negligible (1)**
Birds	**Negligible (1)**
Marine Turtles	**Minor (2)**
Otariid Seals	**Minor (2)**
Very High Frequency Cetaceans	**Negligible (1)**
High Frequency Cetaceans	**Negligible (1)**
Low Frequency Cetaceans	**Minor (2)**
Socio-economic Receptors	**Negligible (1)**
Conservation Values and Sensitivities	**Minor (2)**

Cultural Environment		**Minor (2)**
ALARP Statement	The decision context has been assessed as Type B, with predictive uncertainty managed through sound modelling. The residual consequence ratings are lower order – Minor (2), with higher-order Moderate (3) rating for low frequency cetaceans reduced to Minor (2) through the implementation of a Fauna Management Plan (Appendix N). The adopted control measures minimise impacts from short-term impulsive sound and are considered effective and appropriate to the temporary and reversible nature of the predicted impacts. The adopted engineering, procedural and administrative control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted impacts to receptors from impulsive sound emissions associated with the Otway Exploration Drilling Program are reduced to ALARP.	

6.7.8. Acceptability Assessment

Table 6-38 compares the predicted impact levels of underwater impulsive sounds against the defined acceptable levels.

Table 6-38: Comparison of defined acceptable levels with impact levels for Underwater Sound – Impulsive

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
Principles of ESD	Activities that result in temporary/ reversible, small scale and/or low intensity environmental damage. Environmental impacts and risks have a worst-case consequence ranking less than Major (4).	Planned activities expected to result in impacts ranging from **Negligible (1)** to **Minor (2)**, depending on species.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Underwater sound emissions are listed as a threat within: • The recovery Plan for Marine Turtles in Australia (CoA 2017). • Conservation Management Plan for the Blue Whale (DoE 2015). • Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b). • Conservation advice for fin whales (TSSC 2015d) • Conservation advice for sei whales (TSSC 2015c). • Approved Conservation Advice for Megaptera novaeangliae (humpback whale) (TSSC 2015b). • Recovery Plan for the White Shark (DSEWPaC 2013a). The following does not identify underwater sound emissions as a threat:	Yes

<table>
<tr><th colspan="2">Defined Acceptable Levels</th><th colspan="2" rowspan="2">Predicted Impact Level</th><th rowspan="2">Is predicted impact below defined acceptable level?</th></tr>
<tr><th>Source</th><th>Level</th></tr>
<tr><td></td><td></td><td colspan="2">• South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013).
• National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e).
The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).</td><td></td></tr>
<tr><td>Biological</td><td rowspan="4">No death or injury to listed threatened and migratory species, from the activity.
Biologically important behaviours can continue while the activity is being undertaken.
Anthropogenic noise in biologically important areas will be managed such that:
• Any blue whale continues to utilise the area without injury, and is not displaced from a foraging area
• It does not prevent any southern right whale form utilising the area of cause injury (TTS and PTS) and/or disturbance</td><td colspan="2" rowspan="4">There is a Negligible (1) to Minor (2) consequence level because the behaviour of marine fauna cannot be controlled. However, with the control measures adopted, the likelihood of impulsive sound causing death, injury or behavioural disturbance to threatened species is remote.</td><td rowspan="4">Yes</td></tr>
<tr><td>Ecological</td></tr>
<tr><td>Economic</td></tr>
<tr><td>Cultural</td></tr>
<tr><td>ConocoPhillips Australia Policies</td><td>All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.</td><td colspan="2">Adopted controls measures as listed above have been assessed to ensure that environmental impacts will be of an acceptable level throughout the Otway Exploration Drilling Program.</td><td>Yes</td></tr>
<tr><td>ConocoPhillips Australia Policies</td><td>Environmental impacts and risks are consistent with environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).</td><td>Consequence</td><td>Negligible (1) to Minor (2)</td><td>Yes</td></tr>
<tr><td>Relevant Persons Consultation</td><td>Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons.
The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.</td><td colspan="2">Claims and objections relevant to atmospheric emissions have been considered (with more detail provided in Section 3). These include:
• Org ID: 593, Event ID: 2676, FB ID: 141 – Impacts of sudden noises
• Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 39) – Impact from seabed surveys
• Org ID: 578 AMOG Consulting, Event ID: 3893, FB ID: 418 – Literature on invertebrates
• Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 37 – Effects on fauna</td><td>Yes</td></tr>
</table>

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
		• Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41-45; Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 53; Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 2690, FB ID: 155 – Species for consideration in assessment, BIAs, important behaviours • Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 2690, FB ID: 143, 155; Org ID: 571, Warrnambool Coastcare Landcare Network, Event ID: 3860; FB ID: 154 – Impacts to little penguins • Org ID: 597, Event ID: 1144, FB ID: 32, 33 – Presence of breeding colonies of fur-seals at Deen Maar • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 52 – Impacts on prey species • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 46 – Specific considerations and monitoring and mitigation actions • Org ID: 479, Event ID: 3821, FB ID: 415; Org ID: 406, Event ID: 3850, FB ID: 401; Org ID: 428, Event ID: 2500, FB ID: 242 – Impacts on fish catchability and migration • Org ID: 550, Salty Dog Fishing Charters, Event ID: 1141, FB ID: 25 – Attraction of fish to noise • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 48 – Acoustic monitoring • Org ID: 597, Event ID: 1144, FB ID: 35 – Marine fauna observers • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 278, 280, 309, 338 – Impacts to southern rock lobsters	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type B impacts are considered acceptable if the requirements in Table 6-15 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4).		

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
	Further to this, following the completion of the impact assessment process, the impact of short-term impulsive sound from VSP and geophysical seabed survey techniques, on receptors is acceptable because: • Pinnipeds and high-very high frequency cetaceans will benefit from the controls put in place for EPBC listed low frequency cetaceans. • Following instruction from the Conservation Advice documents and Recovery Plans for the threatened cetacean species, anthropogenic noise and acoustic disturbance will not be a threat as appropriate consideration has been given to the implementation of controls to minimise harm to an acceptable level. • The Conservation Management Plans for the Blue Whale (DoE 2015) and Southern Right Whale (DSEWPaC 2012b), along with EPBC Act Policy Statement 2.1, plus industry standard control measures have been improved for blue whales and southern right whales because of their conservation status. • Impacts associated with impulsive underwater sound from the Otway Exploration Drilling Program are considered to be of an acceptable level given that the effect distances for injury (PTS or TTS) is limited to the immediate vicinity of sound sources and behavioural disturbance will be mitigated through the adoption of control measures, and • Planned short-term impulsive noise emissions do not have the potential to result in long-term, serious, irreversible or cumulative impacts to blue whales and southern right whales, with limited potential for successive, additive or synergistic impacts when considered in relation to other significant activities or projects over temporal and spatial scales, given the effectiveness of control measures in place for these short-term activities. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of short-term impulsive sound emissions on identified receptors. Based on the above evaluation, impacts associated with short-term impulsive sound emissions meet the defined acceptable levels.		

6.7.9. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with impulsive underwater sound from the Otway Exploration Drilling Program are:

- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO4: Biologically important behaviours can continue while the activity is being undertaken.
- EPO9: Anthropogenic noise in biologically important areas will be managed such that:
    - Any blue whale continues to utilise the area without injury, and is not displaced from a foraging area.
    - It does not prevent any southern right whale from utilising the area or cause injury (TTS and PTS) and/or disturbance.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

6.8. Planned Drilling Discharges

6.8.1. Hazards

Drilling activities conducted during the Otway Exploration Drilling Program will result in planned drilling discharges into the marine environment including:

- Drill cuttings and fluids, with a predicted total volume of 2300 m^3 released at the surface and 2170 m^3 released to the seabed, per well.

- Blow-out Preventer (BOP) hydraulic fluid released every 7 days during function testing, with a predicted total volume of 2200 L (2.2 m^3) of potable water with 3 % water soluble control (hydraulic) fluid released per well, including smaller volumes released during latching and unlatching of the BOP at the start and end of each well.
- Cement discharges released to the seabed during primary cementing operations, with a predicted total volume of 30 m^3 per well, and
- Discharges of mixed cement released at the surface and at the seabed from testing, spoils and excess disposal, with a predicted total volume of 40 m^3 per well plus 25 m^3 excess at the final well location.

A combination of seawater and high-viscosity gel sweeps will be used as drilling fluid for the initial conductor and surface-hole sections. Subsequent intermediate and reservoir-hole sections will be drilled with water-based drilling fluids (WBDF). Contingency to use non-aqueous drilling fluids (NADF) is subject to formal technical justification and additional treatment requirements.

An assessment of routine operational discharges within the operational areas is included in Section 6.9.

6.8.2. Environmental Impacts

Planned drilling discharges have the potential to result in an impact to receptors in the marine environment from:

- Changes in water quality
- Changes in sediment quality, and
- Changes in habitat composition.

As a result of changes in water and sediment quality and habitat composition, further impacts may include:

- Injury /mortality to fauna (i.e. through toxicity or physical smothering).

6.8.3. Defining the Environment that May Be Affected (EMBA)

Table 6-39 describes the basis for defining the EMBA for planned drilling discharges, including relevant sources of information and resultant spatial extent.

Table 6-39 Planned drilling discharges EMBA definition

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
Planned drilling discharges	Operational areas	Discharges of drill cuttings and fluids, BOP hydraulic fluids and cement will occur at each well top hole location (on the seabed) and to the surface waters surrounding the MODU.	Neff (2005) indicates that within well-mixed ocean waters (comparable to the operational areas), drill cuttings and fluids will have diluted by over 100-fold within 10 m of the discharge point, with drilling fluid concentration falling below the acute toxicity threshold of 10,000 ppm within 100 m of the discharge source. The dilution factor determined by Neff (2005) of 10,000 is widely accepted within industry. Hinwood et al. (1994) and Neff (2005) found that turbidity in the water column associated with discharges of cuttings and adhered fluids is expected to be reduced to below 10 mg/L (9 ppm) within 100 m of release, substantially below the levels required to cause an effect on fish or invertebrate larvae.	2 km around each well location

6.8.4. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of impacts associated with drilling discharges, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

Planned drilling discharges could impact the:

- Physical environment, affecting water and sediment quality
- Ecological receptors, including plankton, marine invertebrates, benthic habitats and communities, fish, turtles and marine mammals
- Conservation values and sensitivities, including the Zeehan Marine Park, and
- Cultural environment, including First Nations heritage.

During community information sessions, feedback was received around potential impacts to recruitment and long-term sustainability of fisheries (Document ID: 3923).

6.8.5. Consequence Evaluation

6.8.5.1. Drill Cuttings and Fluids

Physical Environment

Planned discharges of drill cuttings and fluids into the marine environment have the potential to alter water and sediment quality and habitat composition within the operational areas.

A combination of seawater and high-viscosity gel sweeps will be used as drilling fluid for the initial conductor and surface-hole sections. These consist of pre-hydrated bentonite, viscosifier (e.g. Xanthum gum) and often a small concentrations of soda ash (Org ID: 54, Event ID: 3789, FB ID: 352). They do not contain oils or heavy metals. A maximum of 420 m^3 of cuttings and 1750 m^3 drilling fluids (2170 m^3 in total) are predicted to be discharged to the seafloor during the drilling of top-hole sections for each well. Subsequent sections will be drilled with water-based drilling fluids (WBDF or drilling muds), with contingency to use non-aqueous drilling fluids (NADF) being subject to formal technical justification and additional treatment requirements. A maximum of 300 m^3 of cuttings and 2000 m^3 of WBDF on cuttings (2300 m^3 in total) are predicted to be discharged from the surface during and following drilling of the bottom-hole sections for each well. Drilling fluids may be discharged intermittently in batches ranging from around 1 m^3 to 400 m^3 and, depending on volume, may be discharged over a matter of minutes or over several hours.

Hinwood et al. (1994) indicates that larger particles of cuttings and adhered muds (90-95%) discharged from the surface fall to the seabed within close proximity of the release point. Larger particles, representing approximately 90% of the mass of mud solids discharged to the marine environment will form a plume which settles swiftly on the seafloor (or until the plume entrains enough seawater to reach neutral buoyancy). The remaining 10% of the mass forms another plume in the upper water column which drifts with prevailing currents away from the source and is diluted rapidly in the water column (Neff 2005; 2010). In well-mixed oceans, comparable to the operational area, drilling cuttings and fluid plume is diluted by more than 100-fold within 10 m of the discharge (Neff 2005), with drilling fluid concentration falling to below acute toxicity threshold of 10,000 ppm within 100 m of the discharge source (Neff 2010). Neff (2005) states that planned drilling discharges are unlikely to cause harm to communities of water column plants and animals due to the rapid mixing and dilution of the drilling mud and cuttings plume.

WBDF have been shown to have little or no toxicity to marine organisms due to the inert / PLONOR (Poses Little or No Risk to the Environment) nature of its components (Jones et al. 1996; Neff, 2005). One, insoluble, component of water-based mud discharges is barite (or Barium sulphate) which has been widely shown to accumulate in sediments following drilling (reviewed by Hartley 1996) and is of low bioavailability and toxicity to benthic organisms.

Metals present in drilling fluids generally resemble that of marine sediments, albeit with concentrations of some metals higher than clean marine sediments (Neff, 2005). Metals associated with WBDF drill cuttings have been shown to have a low bioavailability as they tend to remain in a non-ionic form, remaining bound to other compounds, presenting a low toxicity risk to marine fauna (Neff, 2005). Other metals present in drilling wastes, mainly as salts, may originate from formation cuttings or from impurities in barite and other mud components. Barite used during the Otway Exploration Drilling Program will have very low concentrations of mercury (Hg) and cadmium (Cd) (less than 1 mg/kg and 3 mg/kg respectively) (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 283, 304, 308, 313, 333). A study investigating barite solubility and the release of trace metal compounds recorded that <1% of the mercury and 15% of the cadmium dissolved from the barite after one-week exposure to the marine environment (Crecelius et al. 2007). Further, these do not contribute to mud toxicity due to their low bioavailability (Schaanning et al. 2002).

Marine fauna that are exposed in the laboratory or field to cuttings in sediments do not bioaccumulate significant quantities of metals (Hartley et al., 2003). There is some evidence of a limited bioavailability of a few metals, such as lead and zinc, which are present in cuttings piles; however, doubt remains that metal bioaccumulation in marine fauna from cuttings piles is sufficient to cause harmful effects in marine fauna living on or near cuttings piles (OSPAR, 2019). Neff (2010) concludes that, due to a lack of toxicity and low bioaccumulation potential of drilling fluids, the effects of drilling discharges are highly localised and are not expected to spread through the food web (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 283).

During consultation, feedback was received regarding the types of chemicals using for drilling and their effects (Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 347; Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 277, 281, 283, 306, 314, 316-321; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 222, 223). All chemicals used in discharged streams will be rated Gold/Silver/D or E through Oslo and Paris Conventions (OSPAR) and Offshore Chemical Notification Scheme (OCNS), or have a complete risk assessment. The OSPAR commission has identified substances considered to pose little or no risk (PLONOR) to the environment based on their toxicity, biodegradation and potential to bioaccumulate.

Neff (2010) concludes that, due to a lack of toxicity and low bioaccumulation potential of the drilling fluids, the effects of drilling discharges are highly localised and are not expected to spread through the food web.

Hinwood et al. (1994) explain that the main environmental disturbance from discharging drilling cuttings and fluids is associated with the smothering and burial of sessile benthic and epibenthic fauna. Many studies have shown that the effects on seabed fauna and flora from the discharge of drilling cuttings with water-based muds are minimal, although the presence of drilling fluids in the seabed close to the drilling location (<500 m) can usually be detected chemically (e.g. Cranmer 1988, Neff et al. 1989, Hyland et al. 1994, Daan & Mulder 1996, Currie and Isaacs 2005, OSPAR 2009, Bakke et al. 2013).

Pre- and post-drilling ROV surveys which documented physical smothering effects from WBDF cuttings within 100 m of the well were compared and found that outside the area of smothering, fine sediment was visible on the seabed up to 250 m from the well (Jones et al. 2006; 2012). After three years, there was significant removal of cuttings particularly in the areas with relatively low initial deposition (Jones et al. 2012). The area impacted by complete cuttings cover had reduced from 90 m to 40 m from the drilling location, and faunal density within 100 m of the well had increased considerably and was no longer significantly different from conditions further away.

A recent study on the Northwest Shelf (Jones et al 2021), where in-situ surveys were undertaken during a drilling campaign, suggest a zone of high impact surrounding the drill centre up to 50–75 m in all directions which would have been caused by cuttings and fluid discharges from the MODU. Outside this zone was an area of medium impact up to approximately 200 m where there were clear losses of epifauna, but nevertheless sponges and soft corals were still observed.

During consultation, feedback regarding the potential of improper handling of drilling fluids effecting groundwater resources was raised (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 290, 291, 293). No fluid injection is planned for the drilling campaign. Further, where losses are anticipated drilling fluid will contain an engineered bridging agent to create a seal at the drilling fluid/formation interface to reduce the likelihood of fluid losses as addressed in the Drilling Program (CM09).

The consequence of the planned discharge of drill cuttings and fluids on the physical environment within the operational area has been assessed as **Minor (2)**, based on:

- Discharges will rapidly disperse in the marine environment,
- Impacts are expected to be temporary and localised to an impact area of a few hundred metres from the well and are anticipated to return to pre-impacted state without any long-term impacts to the local physical environment.

Ecological Receptors

Changes to the physical environment as a result of planned discharges of drill cuttings and fluids could result in injury / mortality to ecological receptors within the impact area. Receptors which are susceptible to a change in water quality include plankton, fish, turtles and marine mammals could be impacted within 100 m of each well location, whilst seabed receptors (benthic habitat/assemblages and marine invertebrates) could be impacted within 500 m of each well location.

Jenkins and McKinnon (2006) reported that levels of suspended sediments greater than 500 mg/L are likely to produce a measurable impact upon larvae of most fish species and levels of 100 mg/L where exposure occurs for greater than 96 hours may also affect the larvae of some species. Jenkins and McKinnon (2006) further indicate that levels of 100 mg/L may affect the larvae of several marine invertebrate species. It is understood that the egg and larval stages are more vulnerable to suspended particles than older life stages. Impacts to fish larvae is expected to be limited due to high natural mortality rates (McGurk 1986), intermittent exposure and the dispersive characteristics of the open water in the operational areas.

During consultation, feedback was received regarding the effect of sediment loads on nearshore seawater intakes (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 276, 304, 310-315; Org ID: 13, King Island Marine Research, Event ID: 547, FB ID: 218, 220, 221). Dilution factors identified by Hinwood et al. (1994) and Neff (2005) show that turbidity in the water column is expected to be reduced to below 10 mg/L (9 ppm) within 100 m of release. This suggests that suspended sediment concentrations caused by the discharge of drill cuttings will be substantially below the levels required to cause an effect on fish or invertebrate larvae (i.e. predicted levels are well below a 96-hr exposure at 100 mg/L, or instantaneous 500 mg/L exposure) and minimal impact to larvae is expected from the discharge of drill cuttings. Further, no impacts associated with turbidity are predicted at coastal locations or water intakes, e.g. for aquaculture facilities.

Plankton communities typically have a patchy distribution which is directly connected to localised and seasonal productivity that produces sporadic bursts in populations. Plankton distribution is therefore likely to be variable both spatially and temporally and is likely to comprise characteristics of tropical, southern Australian, central Bass Strait and Tasman Sea distributions. Early life stages of fish (embryos, larvae) and plankton would be most susceptible to toxic exposure from chemicals in the discharged fluids, as they are less mobile and therefore can become exposed to the plume at the discharge point. Although plankton may be sensitive to aspects of marine discharges this is typically for prolonged exposure. Considering the naturally high mortality of plankton and the rapid replacement of the species (Richardson et al. 2017) any impacts from short term exposure to low toxicity fluids discharged to the marine environment are not expected have lethal effects to plankton that are ecologically significant or result in impacts to foraging marine species given the overall abundance of food resources within the region.

A distribution and foraging BIA for the white shark has been identified within the operational areas. The VIC/P79 operational area overlaps the total white shark foraging BIA by <0.22%. Marine discharges from an MODU or equivalent are not identified as a threat in the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a). Sharks will be transient through the area thus impacts are not predicted due to the low toxicity of WBDF and rapid dilution.

No marine turtle BIAs or critical habitat were identified within the operational areas although turtle species may occur. Chemical and terrestrial discharges are identified as a threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017), though not specifically from MODUs. These species would be transient through the area and impacts are not predicted due to the low toxicity of WBDF and rapid dilution.

The operational areas are within a pygmy blue whale foraging and distribution BIA, southern right whale migration BIA, and seabird foraging BIAs. Cetaceans and avifauna are expected to be less sensitive to potential impacts associated with turbidity, compared to fish larvae (described above). Therefore the evaluation of potential impacts to fish larvae provides a conservative evaluation of the level of potential impacts to marine fauna for this discharge.

Although marine discharges from a MODU or equivalent are not identified as a threat to the recovery of the pygmy blue whale (DoE 2015), or to the recovery of the southern right whale (DSEWPaC 2012b), marine pollution by acute and chronic chemical discharge is identified in both plans as a threat that has minor consequences to the population by only affecting individuals (DoE 2015; DSEWPaC 2012). Chemical pollution from other discharges is identified as a threat to southern right whales, particularly within coastal BIAs where regular exposure may occur. Both species are susceptible to impacts from persistent organic pollutants that undergo biomagnification through their food chain, most commonly from herbicides and pesticides.

Given the minor consequence classification in the Conservation Management Plans and the identification of increased threat from discharges in coastal aggregation areas for southern right whales, it is expected that discharges in an offshore area that are of low toxicity and rapidly diluted would be of Minor or lower consequence. Further, these species are likely to be present for restricted periods (pygmy blue whale while foraging) or transient (southern right whale while migrating) within the area and impacts are not predicted due to the low toxicity of WBDF and rapid dilution.

Increases in turbidity from drill cutting discharges during the riserless drilling of the top-hole section (i.e. direct discharge to the seabed) are expected to be highly localised and limited to within close proximity of each well location (below 10 mg/L (9 ppm) within 100 m of release). Given the short duration of riserless drilling (typically six to eight days), effects are expected to be short-term and no more significant than those described above for surface discharges.

Hinwood et al. (1994) explains that the main environmental disturbance from discharging drilling cuttings and fluids is associated with the smothering and burial of sessile benthic and epibenthic fauna. Seabed discharge of drilling cuttings and fluids will result in changes to water quality and sediment quality at the seabed in close proximity to each well (within 500 m), which will directly affect benthic assemblages and marine invertebrates within the impact footprint.

Benthic substrate within the operational area is predicted to be characteristic of the Bass Strait region and contain a mixture of sandy substrate and soft sediment. These environments can appear barren and featureless on the surface; however, they may support a variety of benthic faunal communities such as mollusc, crustaceans and bivalves.

Jones et al. 2012 found that within 3 years the area impacted by complete cuttings cover had reduced from 90 m to 40 m from the drilling location, and faunal density within 100 m of the well had increased considerably and was no longer significantly different from conditions further away. Although studies conducted by Hyland et al. (1994) noted negative response from sponges (disruption to feeding or respiration) resulting from smothering from drill cuttings, it is unlikely that extensive areas of rocky reefs or outcrops (where sponges, coral and more diverse fauna may be present) occur within the operational areas. The presence of wave-sculpted sediment and low-profile limestone pavement reef often inundated by sand has been identified in the Zeehan Marine Park (DNP, 2022).

The consequence of a planned discharges from drilling activities causing injury / mortality to ecological receptors within the operational area has been assessed as **Minor (2)**, based on:

- Discharges will be of low toxicity.
- Discharges will be localised and rapidly disperse in the marine environment.
- Potential impacts to plankton, including fish and invertebrate larvae, is expected to be limited by intermittent exposure and the dispersive characteristics of the open water in the operational areas; and are not expected to result in impacts to foraging marine species given the overall abundance of food resources within the region.
- No migratory or threatened species were identified to be resident within the operational area.
- Identified EPBC listed species that may occur within the operational area, where drilling may occur, are likely to transient within the area.
- The area of impact to benthic habitat and communities is predicted to be small compared to the extent of the distribution of benthic habitats and associated benthic marine fauna found within the operational areas.
- Studies on benthic habitat and assemblages within the operational areas did not identify the area as unique, as such the activities are not predicted to impact marine ecosystem integrity or functioning, and
- The extent of the impact is predicted to be short term and localised.

Conservation Values and Sensitivities

The T/49P operational area partially overlaps the Zeehan Australian Marine Park (AMP). Should the final drilling locations be located within this conservation area, the potential impacts to the ecological environment described above could affect the values and sensitivities of this site.

The South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013) identifies the ecosystems, habitats, communities and sea-floor features associated with the Western Bass Strait Shelf Transition and Bass Strait Shelf Provinces as major conservation values for the Zeehan marine reserve. The Zeehan reserve includes a variety of seabed habitats, including exposed limestone, that support rich animal communities of large sponges and other, permanently fixed, invertebrates on the continental shelf. The rocky limestone provides important habitats for a variety of commercial fish species, such as the Australia's giant crab (*Pseudocarcinus gigas*), and a nursery ground for blue warehou (*Seriolella brama*) and ocean perch (*Sebastes alutus*) (DNP 2013). However, a recent study commissioned by the University of Tasmania for Parks Australia found that the fractured limestone reef pavement in the Zeehan Marine Park was rarely undercut and therefore unsuitable for crevice-dwelling species such as the SRL (Barrett et al. 2023). Additionally, the reserve is a valued area for the white shark, and provides important habitat for both the blue whale and humpback whale. The potential impact area (100 m around each well location [Neff 2010]) is small compared to the size of the AMP (19,897 km^2). Any impacts to physical and ecological receptors, as described above, will be localised and short-term, and widespread changes to the marine environment are not expected. Subsequently, no changes (**Negligible (1)** consequences) to conservation values of the Zeehan AMP are predicted.

6.8.5.2. Blow-out Preventer (BOP) Hydraulic Fluids

Physical Environment

Planned discharges of BOP hydraulic fluids to the marine environment have the potential to change water quality near the discharge point.

Hydraulic fluids will be discharged to the marine environment during BOP installation and function testing every 7 days. Tests are expected to release 2200 L (2.2 m^3) of potable water with 3 % water soluble control fluid (hydraulic fluid). Additionally, smaller volumes will be released as the result of latching and unlatching the BOP at the start/end of each well. Diluted hydraulic control fluids in potable water are water-based, low toxicity and readily biodegradable. Neff (2005) indicates that within well-mixed ocean waters (consistent with the operational areas), fluids will have diluted by over 100-fold within 10 m of the discharge point. The extent within which the BOP hydraulic fluids would disperse is estimated to be within 100 m of the MODU (Neff 2010).

The consequence severity of impacts from planned BOP hydraulic fluid discharges to the physical environment has been assessed as **Minor (2)**, based on:

- BOP hydraulic fluids are biodegradable and not considered to cause serious or irreversible damage to the environment
- Discharges are expected to rapidly disperse in the marine environment, and
- The extent of the impact is predicted to be short term and localised.

Ecological Receptors

Changes in water quality as a result of planned discharges of BOP hydraulic fluids have the potential to result in injury / mortality to marine ecological receptors. Receptors within the 100 m extent of potential impact which are susceptible to a change in water quality include plankton, fish, turtles and marine mammals. Considering that discharges occur into the open water column, they are predicted to mix rapidly and any impact to sediments and benthic biota including invertebrates is not predicted.

Early life stages of fish (embryos, larvae) and plankton would be most susceptible to toxic exposure from chemicals in the discharged fluids, as they are less mobile and therefore can become exposed to the plume at the release point. Although plankton may be sensitive to aspects of marine discharges this is typically for prolonged exposure. Considering the naturally high mortality of plankton and the rapid replacement of the species (Richardson et al. 2017) any impacts from short term exposure to low toxicity fluids discharged to the marine environment are not expected to have effects to plankton that are ecologically significant.

No BIAs or protected habitat were identified for fish species within the operational areas; however, a variety of fish species, including commercial species, may be present. Impacts are not predicted to fish species due to the low toxicity of discharged fluid and rapid dilution and transient nature of fish within operational areas.

A distribution and foraging BIA for the white shark has been identified within the operational areas, although no critical habitats or behaviours are known to occur. Marine discharges from a MODU or equivalent are not identified as a threat in the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a). Sharks will be transient through the operational areas, and thus impacts are not predicted due to the low toxicity of discharged fluids and rapid dilution.

No marine turtle BIAs or critical habitat were identified within the operational areas, although turtle species may occur. Chemical and terrestrial discharges are identified as a threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017), though not specifically from MODUs. As these species would be transient, impacts are not predicted due to the low toxicity of discharged fluids and rapid dilution.

A foraging and distribution BIA for the pygmy blue whale has been identified within the operational areas. Marine discharges from a MODU or equivalent are not identified as a threat to the recovery of pygmy blue whales in the Conservation Management Plan for the Blue Whale (DoE 2015). It is considered highly unlikely that pygmy blue whales would be foraging within 500 m of the MODU for an extended period of time as there are no features where krill would accumulate in abundance. Further, impacts are not predicted due to the low toxicity of discharged fluids and rapid dilution.

A migration BIA for the southern right whale overlap with the operational areas. Marine discharges from a MODU or equivalent are not identified as a threat to the recovery of this species in the Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b).

Although marine discharges from a MODU or equivalent are not identified as a threat to the recovery of the pygmy blue whale (DoE 2015), or to the recovery of the southern right whale (DSEWPaC 2012b), marine pollution by acute and chronic chemical discharge is identified in both plans as a threat that has minor consequences to the population by only affecting individuals (DoE 2015; DSEWPaC 2012). Chemical pollution from 'other discharges' is identified as a threat to southern right whales, particularly within coastal BIAs where regular exposure may occur. Both species are susceptible to impacts from persistent organic pollutants that undergo biomagnification through their food chain, most commonly from herbicides and pesticides.

Given the minor consequence classification in the Conservation Management Plans and the identification of increased threat from discharges in coastal aggregation areas for southern right whales, it is expected that discharges in an offshore area that are of low toxicity and rapidly diluted would be of Minor or lower consequence. Further, these species are likely to be transient within the area (pygmy blue whale while foraging) or transient (southern right whale while migrating) and impacts are not predicted due to the low toxicity of discharged fluids and rapid dilution.

The consequence severity of impacts from planned BOP hydraulic fluid discharges to ecological receptors has been assessed as **Minor (2)**, based on:

- Discharged fluids will be of low toxicity.
- Discharges will be localised and rapidly disperse in the marine environment.
- No migratory or threatened species were identified to be resident within the operational area where drilling may occur.
- Impacts to fish, sharks, marine reptiles and marine mammals, including listed species, are not predicted and

- Potential impacts to plankton are expected to be localised and short term, and are not expected to result in impacts to foraging marine species given the overall abundance of resources within the region.

Conservation Values and Sensitivities

The T/49P operational area partially overlaps the Zeehan Australian Marine Park (AMP). Should the final drilling locations be located within this conservation area, the potential impacts to the ecological environment described above could affect the values and sensitivities of this site.

As described above, the potential impact area (100 m around the well location) is small compared to the extent of the conservation area. Any impacts to physical and ecological receptors, as described above, will be localised and short-term, and widespread changes to the marine environment are not expected. Therefore, no changes (**Negligible (1)** consequences) to conservation values of this area are predicted.

6.8.5.3. Cement

Physical Environment

Primary cement discharges to the seabed and secondary discharges (testing, spoil, excess) at the surface have the potential to change water quality, sediment quality and habitat composition within the operational areas.

Cement discharged at the sea surface is expected to be a combination of cement slurry and wash water and is not expected to exceed 40 m^3 per well, with the exception of an additional 25 m^3 at the final well location. The surface discharge of cement can cause increased turbidity in the water column and result in a temporary change in surface water quality. However, cement particles are expected to disperse under the action of metocean conditions and eventually settle out of the water column.

Modelling of surface cement discharges of approximately 78 m^3 over one hour, conducted for BP (2013), resulted in a suspended solid concentration between 0.005-0.05 mg/m^3 within the extent of the plume (approximately 150 m horizontal and 10 m vertical) over two hours. Four hours post-discharge concentrations were <0.005 mg/m^3. The volume modelled is significantly greater than the surface discharge volume predicted for the Otway Exploration Drilling Program, therefore it is predicted that the concentration of suspended sediments would be lower.

Cement discharged to the seabed is predicted to be 30 m^3 per well. The discharge of cement on the seabed will result in a change in habitat composition. BP (2013) modelled a 200 t (approximately 83 m^3) cement discharge at the seabed and found changes to the benthic environment were limited to 10 m from the discharge point.

The consequence severity of planned cement discharge impacts to the physical environment has been assessed as **Minor (2)**, based on:

- Cement is not considered to pose serious or irreversible damage to the environment
- Surface discharges are predicted to rapidly disperse in the marine environment
- Seabed impacts are predicted to be limited to within 10 m of the discharge point, and
- The extent of the impact is predicted to be short term and localised.

Ecological Receptors

Changes to the physical environment as a result of planned discharges of cement could result in injury/mortality to ecological receptors within the impact area. Receptors which are susceptible to a change in water quality or change in sediment quality include plankton, benthic assemblages, marine invertebrates, fish, marine reptiles and marine mammals.

Early life stages of fish (embryos, larvae) and plankton would be most susceptible to exposure from cement slurry and wash water, as they are less mobile and therefore can become exposed to the plume at the discharge point. Although plankton may be sensitive to aspects of marine discharges this is typically for prolonged exposure. Considering the naturally high mortality of plankton and the rapid replacement of the species (Richardson et al. 2017) any impacts from short term exposure to suspended cement particles are not expected to have lethal effects to plankton that are ecologically significant.

Benthic substrates within the operational areas are predicted to be characteristic of the Bass Strait region and contain a mixture of sandy substrate and soft sediment. These environments can appear barren and featureless on the surface; however, they may support a variety of benthic faunal communities such as mollusc, crustaceans and bivalves. Impacts from cement discharged to the seabed are predicted to be restricted to within 10 m around each well, with a localised change in habitat composition.

Jenkins and McKinnon (2006) reported that levels of suspended sediments greater than 500 mg/L are likely to produce a measurable impact upon larvae of most fish species and levels of 100 mg/L where exposure occurs for greater than 96 hours may also affect the larvae of some species. Jenkins and McKinnon (2006) further indicate that levels of 100 mg/L may affect the larvae of several marine invertebrate species. It is understood that the egg and larval stages are more vulnerable to suspended particles than other life stages. Modelling conducted by BP (2013) suggests that suspended cement particles released into the water column will not be at or near levels required to cause an effect on fish or invertebrate larvae. Predicted levels are well below a 96-hour exposure at 100 mg/L, or an instantaneous 500 mg/L exposure.

No BIAs or protected habitats were identified for fish species within the operational areas; however, a variety of fish species, including commercial species, maybe be present. Impacts are not predicted to fish species due to the low toxicity of the suspended cement particles and rapid dilution.

A distribution and foraging BIA for the white shark has been identified within the operational areas, although no critical habitats or behaviours are known to occur. Marine discharges from a MODU or equivalent are not identified as a threat in the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a). Sharks will be transient through the area, and thus impacts are not predicted due to the low toxicity of the suspended cement particles and rapid dilution.

No marine turtle BIAs or critical habitat were identified within the operational areas although turtle species may occur. Chemical and terrestrial discharges are identified as a threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017), though not specifically from MODUs. As these species would be transient, impacts are not predicted due to the low toxicity of the suspended cement particles and rapid dilution.

A foraging and distribution BIA for the pygmy blue whale has been identified within the operational areas. Marine discharges from a MODU or equivalent are not identified as a threat to the recovery of pygmy blue whales in the Conservation Management Plan for the Blue Whale (DoE 2015).

A migration BIA of the southern right whale overlaps with the operational areas. Marine discharges from a MODU or equivalent are not identified as a threat to recovery in the Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b).

Although cement discharges from a MODU or equivalent are not identified as a threat to the recovery of the pygmy blue whale (DoE 2015), or to the recovery of the southern right whale (DSEWPaC 2012b), marine pollution by acute and chronic chemical discharge is identified in both plans as a threat that has minor consequences to the population by only affecting individuals (DoE 2015; DSEWPaC 2012). Chemical pollution from other discharges is identified as a threat to southern right whales, particularly within coastal BIAs where regular exposure may occur. Both species are susceptible to impacts from persistent organic pollutants that undergo biomagnification through their food chain, most commonly from herbicides and pesticides.

Given the minor consequence classification in the Conservation Management Plans and the identification of increased threat from discharges in coastal aggregation areas for southern right whales, it is expected that discharges in an offshore area that are of low toxicity and rapidly diluted would be of Minor or lower consequence. Further, these species are likely to be transient within the area (pygmy blue whale while foraging) or transient (southern right whale while migrating) and impacts are not predicted due to the low toxicity of suspended sediment particles and rapid dilution.

The consequence severity of impacts from planned cement discharges to ecological receptors has been assessed as **Minor (2)**, based on:

- Discharges will rapidly disperse in the marine environment.
- No migratory or threatened species were identified to be resident within the operational area where drilling may occur.
- Impacts to fish, sharks, marine reptiles and marine mammals, including listed species, are not predicted, and
- The extent of the impact is predicted to be short term and localised.

Conservation Values and Sensitivities

The operational areas partially overlap the Zeehan AMP. If operational discharges occur within or adjacent to this conservation area, the potential impacts to the physical and ecological environment described above could affect the values and sensitivities of this site.

As described above, the potential impact area (150 m for the plume extent and 10 m for the seabed extent around each well location) is small compared to the extent of the conservation areas. Any impacts to physical and ecological receptors, as described above, will be localised and short-term, and widespread changes to the marine environment are not expected. Therefore, no changes (**Negligible (1)** consequences) to conservation values of this area are predicted.

6.8.5.4. Cultural Environment

As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the operational areas overlap Sea Country for the duration of the activity.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by drilling discharges.

Planned discharges are assessed as having a minor consequence to the physical and ecological environments and negligible consequences to conservation values and sensitivities in offshore waters, with no long-term or population level impacts predicted as described above. They are therefore predicted to have **Minor (2)** consequences to any associated cultural values.

6.8.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context A** has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower-order impacts are managed to ALARP and acceptable levels.

Table 6-40 documents the assessment of control measures and ALARP demonstration for planned drilling discharges.

Table 6-40: Control measures for planned drilling discharges and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
CM12: General and Hazardous Chemical Management Procedures	A chemical selections procedure will be in place to assess chemicals that have the potential to be discharged to the environment. The procedure will require all chemicals used and potentially discharged to the sea to be environmentally acceptable. All chemicals discharged will be rated Gold/Silver/D or E through OCNS, or PLONOR substances listed by OSPAR, or have a complete risk assessment. This control addresses Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development (IFC 2015) – Drilling Fluids and Drilled Cuttings Guidance Number 59 that requires operators to carefully select drilling fluid additives, considering their concentration, toxicity, bioavailability, and bioaccumulation potential.
CM09: Drilling Program	A cuttings management system will be in place that uses a closed circulating system to reduce the concentration of drilling mud on cuttings prior to discharge, thereby reducing the total volume of mud discharged to sea. All well returns to the MODU will be diverted to shale shakers, except if drilling with seawater. The shale shakers will be fitted with screens that meet API standards for particle size cut points. Centrifuges will be used as required to remove additional finer drilled cuttings/solids that are too small for the shale shakers. Adherence to international best practice standards (Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 223): • Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development (IFC 2015) – Drilling Fluids and Drilled Cuttings Guidance Number 53 requires consideration of discharges of drilling fluids including chemical content. • Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development (IFC 2015) – Drilling Fluids and Drilled Cuttings Guidance Number 59 requires that environmental hazards related to residual chemical additives on discharged cuttings are reduced through the drilling fluid selection. Only residual water-based fluid systems, brine, completion chemicals, cement and cement spacer within MODU mud pits and surface tanks that are no longer required will be diverted overboard. Unusable inventories of bulk cement, drilling fluid solid additives, brine and drill water on-board the MODU will be managed according to the specific environmental performance standards (specified in Table 9-1). Inventory will be recycled before being disposed of overboard, where possible. Where losses are anticipated, drilling fluid will contain an engineered bridging agent to create a seal at the drilling fluid/formation interface to reduce the likelihood of fluid losses (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 290, 291, 293).

CM02: Vessel and MODU Operating Procedures	Systems that generate or treat planned discharges are required to be operated in accordance with manufacturer's instructions and maintained in accordance with manufacturer's specification as detailed within the preventative maintenance system, to ensure efficient operation.		
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).		
CM11: Procurement Vetting Process	Third party equipment used to treat planned discharges, e.g. centrifuges, cuttings driers, etc will be verified as fit for purpose.		
Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Skip and ship drilling/cement waste to shore	Eliminates discharges to sea therefore reducing potential impacts to the marine environment.	Evaluation of trade-offs indicates that the implementation of skip and ship – i.e. additional storage space for containment of waste, increased transfers to vessels/shore base, increased fuel usage, increased crane movements and increased HSE risks – would introduce significant cost and effort that is grossly disproportionate to the benefit.	Reject
No drilling discharges within the boundaries of the Zeehan AMP	May reduce impacts to water quality within the AMP, depending on alternative discharge locations and ocean currents.	In addition to the above, if drilling were to occur within the Zeehan AMP, the evaluation of trade-offs indicates increased environmental impacts associated with underwater sound from increased vessel movements which are more likely to impact on conservation values cited within the South-east Commonwealth Marine Reserves Network Management Plan (DNP, 2013) for the Zeehan AMP.	Reject
Reinject fluids and cuttings to below sea surface	Drilled solids (cuttings) are released deeper into the water column, thereby potentially reducing the spatial extent of the turbidity plume.	Significant cost associated with engineering, fabricating and installing chute and managing the re-injection process. Evaluation of trade-offs indicates increased operational and HSE risks, with potential to cause delays. Further, increased depth of concentrated cuttings deposition may inhibit infauna recovery at the seabed. This would introduce significant cost and effort that is grossly disproportionate to the benefit.	Reject
Riserless Mud Recovery (RMR) System	RMR recirculates drill cuttings and fluids from the top-hole of the well eliminating discharge to the seabed (when applied in conjunction with containment and transfer to shore). RMR may also be implemented where shallow hazards are anticipated.	Given that low to no toxicity water-based fluids will be used for riserless drilling sections and shallow hazards are not anticipated, there is limited technical benefit in utilising this system and it would introduce significant cost and effort that is grossly disproportionate to the benefit.	Reject
Reduction			
Slim hole / coil tubing drilling	This drilling technique results in a reduction in the volume of cuttings produced.	Given that the Otway Exploration Drilling Program is exploratory, and there is some uncertainty in the formation that may be encountered, ConocoPhillips Australia has	Reject

		adopted a conventional hole size to intersect the target reservoir, thus allowing for contingent hole sizes should any drilling problems occur. Slim hole drilling is more suited to field development and onshore operations where rig motions are not encountered.	
Solids Control Equipment (SCE)	Additional equipment such as cuttings driers, thermal desorption and thermomechanical cleaning can be used to reduce the volumes of oil on cuttings. Equipment such as de-sanders, de-silters and centrifuges are used to reduce the solids content during treatment of used drilling fluids, while thermal desorption and thermal mechanical cleaning units are designed to clean oily residues from oily cuttings prior to their discharge. The addition of one or more of these control measures would result in a reduction in the overall level of environmental impact associated with the discharge of cuttings.	The MODU is to be fitted with industry-leading proven solids control systems to reduce lost fluid and ensure a maximum amount of drilling fluids are recycled and their useful life extended. Thermal desorption technology is not fitted to the MODU, due to this equipment not being available for rent, Given the significantly high purchase price, elevated running costs (energy consumption) and significant MODU modifications required to install, thermal desorption technology is not considered a feasible option. ConocoPhillips Australia considers the adoption of thermal desorption technology to be grossly disproportionate to the limited environmental benefit gained via a further reduction (likely in the order of 4 to 5%) in overall residual fluid on cuttings in a deep water, open-ocean environment where cuttings are predicted to disperse rapidly.	Adopt CM09: Drilling Program
Early establishment of a closed circulating system	Establishes a closed circulating mud system which provides the opportunity to re-use drilling fluids thereby reducing environmental discharges. This control does not reduce the volume of drilled cuttings discharged.	Given that low toxicity water-based fluids will be used for riserless drilling sections and shallow hazards are not anticipated, there is limited technical benefit in utilising this system and it would introduce cost and effort that is grossly disproportionate to the benefit.	Reject
Barite Quality Standard (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 283, 304, 308, 313, 333)	Adheres to the IFC EHS guidelines (2015) effluent levels of 1 mg/kg of Hg (dry weight) and no more than 3 mg/kg of Cd (dry weight).	The requirement will need to be communicated to the drilling fluids contractor. Negligible associated costs.	Adopt CM12: General and Hazardous Chemical Management Procedures
Minimising disposal of bulk powders	Using best available techniques avoids/minimises discharges of wastes containing mercury consistent with the Minamata Convention.	Backload of bulks to shore has been considered and significant safety risks were identified. Evaluation of trade-offs also indicates additional vessel emissions and discharges, and risk of vessel related incidents are increased. The impact of discharges has been assessed as Minor in EP Section 6.8.5, with no long-term effects. If bulks cannot be transferred to the next operator or safely returned to shore, they may be mixed with water and discharged as a dilute slurry. Additionally discharges of excess cement may be minimised through the placement of additional non-barrier plugs within the wellbore.	Adopt CM09: Drilling Program
Mitigation			
Avoid periods of marine fauna sensitivity	Managing the timing to avoid biologically important behaviours within the pygmy blue whale foraging BIA (November to June) and	There is no operational window where either species may not potentially be present, albeit at variable numbers. Given the challenges associated with securing and scheduling a	Reject

	migration BIA for the southern right whale (April-October) may mitigate contact with discharges.	MODU, and that acute and chronic chemical discharge is identified in the CMPs as a threat that of minor consequences, seasonal restrictions would introduce significant cost and effort that is grossly disproportionate to any benefit.	

Residual Impact Consequence Ratings	
Physical Environment	**Minor (2)**
Ecological Receptors	**Minor (2)**
Conservation Values and Sensitivities	**Negligible (1)**
Cultural Environment	**Minor (2)**
ALARP Statement	The decision context has been assessed as Type A and the residual consequence ratings are lower order – Minor (2). The adopted control measures minimise impacts from planned drilling discharges and are considered effective and appropriate to the temporary, small scale and recoverable nature of the predicted environmental impacts. The adopted engineering, procedural and administrative control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific physical, ecological, conservation and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted impacts to receptors from planned drilling discharges associated with the Otway Exploration Drilling Program are reduced to ALARP.

6.8.7. Acceptability Assessment

Table 6-41 compares the predicted impact levels from planned drilling discharges against the defined acceptable levels.

Table 6-41: Comparison of defined acceptable levels with impact levels for planned drilling discharges

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
Principles of ESD	Activities that result in temporary/ reversible, small scale, and/or low intensity environmental damage. Environmental impacts have a worst-case consequence ranking less than **Major (4)**.	Planned drilling discharges are expected to result in **Minor (2)** impacts to relevant species and habitats, with no changes (**Negligible (1)** consequences) to conservation values or sensitivities.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Chemical and terrestrial discharges are listed as a threat in the: • Recovery Plan for Marine Turtles in Australia (CoA 2017). The following do not identify planned discharges as a threat: • The South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013). • Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a).	Yes

Defined Acceptable Levels		Predicted Impact Level		Is predicted impact below defined acceptable level?
Source	**Level**			
		• Conservation Management Plan for the Blue Whale (DoE 2015). • Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b). The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).		
Biological Ecological Economic Cultural	No death or injury to listed threatened or migratory species, from the activity. No unplanned objects, emissions or discharges to sea or air. No substantial or unrecoverable change in water quality or seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.	There are **Negligible (1)** to **Minor (2)** consequences of temporary, reversible and small-scale impacts from planned drilling discharges which do not have the potential to result in long-term, serious or irreversible impacts.		Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted control measures have been assessed to ensure that environmental impacts will be of an acceptable level throughout the activity.		Yes
	Environmental impacts are consistent with environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).	Consequence	**Negligible (1)** to **Minor (2)**	Yes
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to drilling discharges have been considered (with more detail provided in Section 3). These include: • Document ID: 3923 – Recruitment and long-term sustainability of fisheries • Org ID: 54, Event ID: 3789, FB ID: 352 – Composition of drilling muds • Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 347; Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 277, 281, 283, 306, 314, 316-321; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 222, 223 – Chemical selection process, effects of discharges and chemicals used for drilling • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 290, 291, 293 – Impacts to groundwater • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 276, 304, 310-315; Org ID: 13, King Island Marine Research, Event ID: 547, FB ID: 218, 220, 221 – Sediment loads at seawater intakes • Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 223 – Best Practice requirements		Yes

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
		• Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 283, 304, 308, 313, 333 – Metals • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 290, 291, 293 – Reducing likelihood of fluid loss to formations • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	The management practices listed in the World Bank (2015) Environmental, Health and Safety Guideline Offshore Oil and Gas Development and the Minamata Convention have been considered.	Yes
Acceptability Statement	Decision-type A impacts are considered acceptable if the requirements in Table 6-41 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4). Further to this, following completion of the impact assessment process, the impact of planned drilling discharges on receptors is acceptable because: • The area of impact, and therefore the scale of the impact, is expected to be small. • No serious or irreversible damage to receptors is expected. • Impacts are predicted to be localised and temporary, with no long-term population-level impacts on productivity or viability. • Given that no long-term population-level impacts on productivity or viability are predicted, planned drilling discharges are not identified as, or predicted to be, a threat to the sustainability of commercial fisheries within the area. • The temporary, small-scale and reversible impacts associated with planned drilling discharges are considered to be of an acceptable level given the existing condition and assimilative capacity of the receiving environment, and • Planned drilling discharges do not have the potential to result in long-term, serious, irreversible or cumulative impacts, with limited potential for successive, additive or synergistic impacts when considered in relation to other significant activities or projects over temporal and spatial scales. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of planned drilling discharges on all identified receptors. Based on the above evaluation, impacts associated with planned drilling discharges meet the defined acceptable levels.		

6.8.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with planned drilling discharges from the Otway Exploration Drilling Program are:

- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO6: No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.
- EPO7: No unplanned objects, emissions or discharges to sea or air.

- EPO10: No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

6.9. Planned Operational Discharges

6.9.1. Hazards

Vessel and MODU activities conducted during the Otway Exploration Drilling Program will result in planned operational discharges to the marine environment. Most streams require treatment prior to discharge, and may include:

- Brine, a by-product of the desalinisation process whereby dissolved salts and minerals are removed from seawater to produce purified freshwater
- Putrescible waste, being organic waste materials that are prone to decomposition and decay
- Cooling water, used to remove heat from equipment or processes to preventing overheating and maintain optimal operating conditions
- Bilge water, a combination of various liquids, such as seawater, rainwater and water from various onboard sources including leaks, condensation and wastewater
- Grey water, wastewater generated from sources such as sinks, showers, bathtubs, and washing machines, and
- Sewage.

Quantities of planned discharges within the operational areas are calculated based on the number of people on board (POB) and are provided in Section 2.

6.9.2. Environmental Impacts

Planned operational discharges have the potential to result in an impact to receptors in the marine environment from changes in water quality such as increased temperature, salinity, nutrients and the addition of chemicals and hydrocarbons.

As a result of a change in water quality, further impacts may include:

- Injury/mortality to fauna (i.e., through toxicity), and
- Behavioural changes if fauna habituate to certain waste streams, e.g. putrescible waste, as a food source.

6.9.3. Defining the Environment that May Be Affected (EMBA)

Table 6-42 describes the basis for defining the EMBA for planned operational discharges, including relevant sources of information and resultant spatial extent.

Table 6-42: Planned operational discharges EMBA definition

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
Planned operational discharges	Operational areas	Routine operational discharges will occur to surface waters within the operational areas as a result of vessel and MODU operations.	The NERA (2018b) Environment Plan Reference Case for Planned Discharge of Sewage, Putrescible Waste and Grey Water determined that a 150 m^3/day discharge to the offshore marine environment is expected to remain within the nominal mixing zone boundary of 500 m around fixed facilities with a POB up to 400. As the POB of the MODU and vessels is less than 400 (130 POB for the MODU, a maximum of	500 m around each vessel and well location

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
			60 for each vessel), 500 m is assumed to be a conservative spatial boundary. Modelling of continuous wastewater discharges, including cooling water, bilge water and brine, conducted by Woodside (2014) and Shell (2009) predicted smaller mixing zones (<100 m). Once released, discharged wastewaters will be dispersed by metocean conditions and rapidly mixed through the surface water layers.	

6.9.4. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of impacts associated with operational discharges, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

Planned operational discharges can result in changes to the:

- Physical environment, affecting water quality
- Ecological receptors, including plankton, fish, turtles, seabirds and marine mammals
- Conservation values and sensitivities, including the Zeehan Marine Park, and
- Cultural Environment, including First Nations heritage.

6.9.5. Consequence Evaluation

6.9.5.1. Physical Environment

Planned operational discharges to the marine environment have the potential to alter water quality within the operational areas. Impacts to water quality will occur due to:

- Intermittently elevated nutrient levels from sewage, putrescible waste and grey water discharges, limited to 500 m from the MODU and vessels (based on discharges from a conservative 400 POB fixed facility, NERA 2018b).
- Elevated water temperature from cooling water discharges, predicted to be less than 11°C above ambient within 100 m (horizontally) of the discharge point, and 10 m vertically (Woodside 2014) (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 272, 295-298, 303, 307; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 216, 217, 219).
- Elevated salinity levels and chemical additives from brine discharges, modelled by the US EPA as diluted 40-fold within 4 m with no ocean current (Woodside 2014), and
- Intermittently elevated hydrocarbon levels within 100 m of bilge water discharge (Shell 2009), from engine oil, lubricants, fuel residues and other petroleum-based substances that may have leaked or spilled into the bilge.

Cumulative impacts from planned operational discharges may occur for short periods when support vessels are within 500 m of the MODU, i.e. during resupply activities. The small quantities involved and intermittent nature of the discharges are not predicted to increase the impact extent beyond 500 m (based on discharges from a conservative 400 POB fixed facility, NERA 2018b).

Discharges of sewage, putrescible waste and grey water from vessels and the MODU involve relatively small volumes which are predicted to mix and disperse quickly over a small area, given the regional wind and large-scale current patterns in the region.

The consequence of planned operational discharges on the physical environment within the operational areas has been assessed as **Minor (2)**, based on:

- Discharges will rapidly disperse in the marine environment.
- Impacts, including cumulative impacts, are expected to be temporary and localised, and
- The marine environment is anticipated to return to a pre-impacted state without any long-term impacts to the local physical environment.

6.9.5.2. Ecological Receptors

Changes to water quality as a result of planned operational discharges could result in injury / mortality or a change in behaviour of ecological receptors within the impact area. Receptors susceptible to a change in water quality, including plankton, fish, turtles, seabirds and marine mammals, could be impacted within 500 m of the MODU and vessels.

Wastewaters

Plankton communities typically have a patchy distribution which is directly connected to localised and seasonal productivity that produces sporadic bursts in populations. Plankton distribution is therefore likely to be variable both spatially and temporally and is likely to comprise characteristics of tropical, southern Australian, central Bass Strait and Tasman Sea distributions. Early life stages of fish (embryos, larvae) and plankton would be most susceptible to toxic exposure from chemicals in discharges, as they are less mobile and therefore can become exposed at the discharge point. However, negligible effects are expected given previous studies on wastewater discharges which show no elevation in levels above background concentrations in proximity to the discharge point (Woodside 2008; 2014; Shell 2009). Therefore, considering the naturally high mortality of plankton and the rapid replacement of the species (Richardson et al. 2017) any impacts from short term exposure to low toxicity fluids discharged to the marine environment are not expected have lethal effects to plankton that are ecologically significant or result in impacts along the food-chain, for example to foraging marine species, given the overall abundance of food resources within the region.

A distribution and foraging BIA for the white shark has been identified within the operational areas. The VIC/P79 operational area overlaps the total white shark foraging BIAs by <0.22%. Marine discharges from a MODU or equivalent are not identified as a threat in the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a). Sharks will be transient through the area thus impacts are not predicted due to the low toxicity of discharges and rapid dilution.

No BIAs or protected habitat were identified for other fish species within the operational areas and no features have been identified with the potential to support site attached species. Although a variety of fish species, including commercial species, maybe be present in the area, impacts are not predicted as fish species would be transient within the operational areas and any discharges are of low toxicity and will dilute rapidly.

No BIAs or critical habitat were identified for marine turtles within the operational areas although some species may occur. Chemical and terrestrial discharge are identified as a threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017). However, due to the low toxicity of planned discharges and their rapid dilution as a result of oceanic conditions, along with the transient nature of these species within the area, impacts are not predicted to occur.

The operational areas are within a pygmy blue whale foraging and distribution BIA, southern right whale migration BIA, and seabird foraging BIAs. Cetaceans and avifauna are expected to be less sensitive to potential impacts from discharges and the evaluation of potential impacts to fish larvae and plankton (described above) provides a conservative evaluation of the level of potential impacts to other marine fauna for this discharge.

Marine discharges from a MODU or equivalent are not identified as a threat to the recovery of pygmy blue whales within the Conservation Management Plan for the Blue Whale (DoE 2015). Marine pollution by acute and chronic chemical discharge is identified as a threat that has minor consequences to the population by only affecting individuals (DoE 2015). The minor consequence classification in the Conservation Management Plan, along with the low toxicity of discharges and expected rapid dilution, means that any effects are expected to be of Minor or lower consequence.

Further, marine discharges from a MODU or equivalent are not identified as a threat to the southern right whale recovery within the Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012). Marine pollution by acute and chronic chemical discharge is identified as a threat that has minor consequences to the population by only affecting individuals (DSEWPaC 2012). Chemical pollution from sewage and other discharges is identified as a threat to the species, particularly within coastal BIAs where regular exposure may occur. Given the minor consequence classification in the Conservation Management Plan and the identification of increased threat from discharges in coastal aggregation areas, it is expected that discharges in an offshore area that are rapidly diluted would be of Minor or lower consequence.

The consequence of planned operational discharges to ecological receptors within 500 m of the source in operational areas has been assessed as **Minor (2)**, based on:

- Discharges will be of low toxicity and will rapidly disperse in the marine environment.
- Impacts are expected to be temporary and localised, and the marine environment is anticipated to return to pre-impacted state without any long-term impacts to the local physical environment.
- Vessel and MODU discharges are not identified as threats in the recovery of the white shark in species specific recovery plans.
- Planned operational discharges do not represent acute chemical discharges. Acute chemical discharges are listed as threats with minor consequence affecting the individual but not the population in both the blue whale and southern right whale conservation management plans, and
- Potential impacts to plankton are predicted to be localised and short term and are not predicted to result in impacts along the food chain, including to foraging marine species, given the overall abundance of resources within the region.

Putrescible Waste

Fish species may become attracted to food waste discharged from the MODU and vessels. However, discharges will be sporadic over short durations and are not predicted to result in habituation.

There are no habitats critical to the survival of seabirds within the operational areas. However, MODU and vessels will discharge food waste within an area that overlaps with total foraging BIAs for several seabirds including albatross species (0.12%), common-diving petrel (1.03%), white-faced storm petrel (<0.01%), wedge-tailed shearwater (0.55%) and the short-tailed shearwater (0.25%). The Australasian gannet, common-diving petrel, white-faced storm petrel, wedge-tailed shearwater and the short-tailed shearwater have no conservation or recovery plans in place. The National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e) and the Wildlife Conservation Plan for Seabirds (DCCEEW 2020) acknowledges marine pollution as a threat to these species. However, considering the sporadic nature and short duration of discharges habituation is not predicted.

The intermittent discharge of up to 520 kg/day of macerated putrescible waste to the marine environment will result in a temporary localised increase in nutrients in the water column affecting ecological receptors within 500 m of the source in the operational areas. The consequence of this discharge has been assessed as **Minor (2)**, based on:

- Discharges will be sporadic over short durations and are not predicted to result in habituation, and
- Discharges into the open oceanic environment are predicted to mix rapidly with the surrounding waters, with no lasting effects to the physical or ecological environment.

6.9.5.3. Conservation Values and Sensitivities

The T/49P operational area partially overlaps the Zeehan AMP. If operational discharges occur within or adjacent to this conservation area, the potential impacts to the physical and ecological environment described above could affect the values and sensitivities of this site.

The South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013) identifies the ecosystems, habitats, communities and sea-floor features associated with the Western Bass Strait Shelf Transition and Bass Strait Shelf Provinces as major conservation values for the Zeehan Marine Park. The Zeehan Marine Park includes a variety of seabed habitats, including exposed limestone which provides important habitats for a variety of commercial fish species, such as the Australia's giant crab (*Pseudocarcinus gigas*), a nursery ground for blue warehou (*Seriolella brama*) and ocean perch (*Sebastes alutus*) (DNP 2013). Additionally, the reserve is a valued area for the white shark and provides important habitat for both the blue whale and humpback whale. The potential impact area (500 m from the source) is small compared to the size of the AMP (19,897 km^2). Any impacts to physical and ecological receptors, as described above, will be localised and short-term, and widespread changes to the marine environment are not expected. Subsequently, no changes (**Negligible (1**) consequences) to conservation values of the Zeehan AMP are predicted.

6.9.5.4. Cultural Environment

As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the operational areas overlap Sea Country for the duration of the activity.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by operational discharges.

Planned operational discharges are assessed as having a minor consequence to the physical and ecological environments and **Negligible (1)** consequence to conservation values and sensitivities in offshore waters, with no long-term or population level impacts predicted as described above. They are therefore predicted to have a **Minor (2)** consequence to associated cultural values.

6.9.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, Decision **Context A** has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower-order impacts are managed to ALARP and acceptable levels.

Table 6-43 documents the assessment of control measures and ALARP demonstration for planned operational discharges.

Table 6-43: Control measures for planned operational discharges and ALARP demonstration

<table>
<tr><th colspan="4">Adopted Control Measures</th></tr>
<tr><th>Control</th><th colspan="3">Source of good practice control measure</th></tr>
<tr><td>CM01: Marine Assurance Process</td><td colspan="3">The Protection of the Sea (Prevention of Pollution from Ships Act 1983) regulates Australian vessels with respect to ship-related operational activities and invokes certain requirements of the MARPOL Convention relating to discharge of noxious liquid substances including oil, sewage, putrescible waste, garbage, air pollution etc (Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 223).</td></tr>
<tr><td>CM02: Vessel and MODU Operating Procedures</td><td colspan="3">Systems that generate or treat planned discharges are required to be operated in accordance with manufacturer's instructions and maintained in accordance with manufacturer's specification as detailed within the preventative maintenance system, to ensure efficient operation.</td></tr>
<tr><td>CM05: Cultural Heritage Protection Program</td><td colspan="3">A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).</td></tr>
<tr><td>CM11: Procurement Vetting Process</td><td colspan="3">Third party equipment used to treat planned operational discharges will be verified as fit for purpose.</td></tr>
<tr><td>CM12: General and Hazardous Chemical Management Procedures</td><td colspan="3">A Chemical Selection Process will be in place to assess chemicals that have the potential to be discharged to the environment. The procedure will require all chemicals used in known discharges to the sea to be environmentally acceptable (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 281, 316-321; Org ID: 13, King Island Marine Research, Event ID: 547, FB ID: 222).
All chemicals discharged will be rated Gold/Silver/D or E through OCNS, or PLONOR substances listed by OSPAR, or have a complete risk assessment.
This control addresses Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development (IFC 2015) – Drilling Fluids and Drilled Cuttings Guidance Number 59 that requires operators to carefully select drilling fluid additives, considering their concentration, toxicity, bioavailability, and bioaccumulation potential.</td></tr>
<tr><th colspan="4">Additional Controls Assessed – ALARP Assessment</th></tr>
<tr><th>Control</th><th>Benefit Analysis</th><th>Cost Analysis</th><th>Control Adopted?</th></tr>
<tr><th colspan="4">Elimination</th></tr>
<tr><td>Mandatory closed drain system to prevent deck drainage discharged overboard</td><td>Eliminates the risk of oily water from the deck being discharged overboard without treatment and ensures that wastewater is directed to an oily water treatment system for treatment prior to discharge.</td><td>The installation of a treatment system, modification to MODU and vessels, additional deck space required and additional transfers to/from MODU and vessels which increases fuel usage and safety risks to personnel during transfer – would introduce significant cost and effort that is grossly disproportionate to the benefit.</td><td>Reject</td></tr>
</table>

Storage of all wastes on-board for disposal onshore	Eliminates localised impacts to water quality associated with the discharges.	Increased environmental impacts through increased fuel consumption and atmospheric emissions, both by the vessel (or transport vessel) having to return to port a number of times to unload the wastes, and by land transport to the nearest disposal facility, increased energy consumption and atmospheric emissions would also result from the disposal (e.g. incineration, treatment etc.) of the wastes – would introduce significant cost and effort that is grossly disproportionate to the benefit.	Reject
No operational discharges within the boundaries of the Zeehan AMP	May reduce impacts to water quality within the AMP, depending on alternative discharge locations and ocean currents.	If drilling is occurring within the AMP, the evaluation of trade-offs indicates increased environmental impacts associated with additional storage space for containment of waste, increased transfers to vessels/shore base, increased fuel usage, increased crane movements and increased HSE risks as well as increased sound from increased vessel movements which are more likely to impact on conservation values cited within the South-east Commonwealth Marine Reserves Network Management Plan (DNP, 2013) for the Zeehan AMP. Would introduce significant cost and effort that is grossly disproportionate to the benefit.	Reject
Reduction			
Discharge cooling water above sea level to allow it to cool further before mixing at sea surface	Reduces temperature gradient between discharge and ambient water temperature, resulting in reduced localised impact.	Altering all current vessels to allow for discharge of cooling water at a different height would introduce significant cost and effort that is grossly disproportionate to the benefit.	Reject

Residual Impact Consequence Ratings	
Physical Environment	**Minor (2)**
Ecological Receptors	**Minor (2)**
Conservation Values and Sensitivities	**Negligible (1)**
Cultural Environment	**Minor (2)**
ALARP Statement	The decision context has been assessed as Type A and the residual consequence ratings are lower order - Minor (2). The adopted control measures minimise impacts from planned operational discharges and are considered effective and appropriate to the temporary, small scale and recoverable nature of the predicted environmental impacts. The adopted procedural and administrative control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific physical, ecological, conservation and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process. However, none were identified that provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted impacts to receptors from planned operational discharges associated with the Otway Exploration Drilling Program are reduced to ALARP.

6.9.7. Acceptability Assessment

Table 6-44 compares the predicted level of impact from planned operational discharges against the defined acceptable levels.

Table 6-44: Comparison of defined acceptable levels with impact levels for planned operational discharges

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	**Level**		
Principles of ESD	Activities that result in temporary/ reversible, small scale, and/or low intensity environmental damage.	Planned operational discharges are expected to result in **Minor (2)** impacts to relevant species and habitats, with no changes	Yes

Defined Acceptable Levels – Source	Defined Acceptable Levels – Level	Predicted Impact Level	Is predicted impact below defined acceptable level?
	Environmental impacts have a worst-case consequence ranking less than **Major (4)**.	(**Negligible (1)** consequences) to conservation values or sensitivities.	
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Planned marine discharges are listed as a threat to turtles in the: • Recovery Plan for Marine Turtles in Australia (CoA 2017). • The following do not identify planned discharges as a threat: • The South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013). • Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a). • Conservation Management Plan for the Blue Whale (DoE 2015). • Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b). • National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e) • Wildlife Conservation Plan for Seabirds (DCCEEW 2020) The activity will be managed in a way that is consistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).	Yes
Biological Ecological Economic Cultural	No death or injury to listed threatened or migratory species, from the activity. No unplanned objects, emissions or discharges to sea or air. No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.	There are **Negligible (1)** to **Minor (2)** consequences of temporary, reversible and small-scale impacts from planned operational discharges which do not have the potential to result in long-term, serious or irreversible impacts.	Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted control measures have been assessed to ensure that environmental impacts will be of an acceptable level throughout the activity.	Yes
ConocoPhillips Australia Policies	Environmental impacts and risks are consistent with environmental policies and processes such that environmental impacts will have a consequence severity less than Major (4).	Consequence: **Negligible (1)** to **Minor (2)**	Yes

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to operational discharges have been considered (with more detail provided in Section 3). These include: • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 272, 295-298, 303, 307; Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 216, 217, 219 – Elevated water temperature • Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 223 - Best Practice requirements including testing • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 281, 316-321; Org ID: 13, King Island Marine Research, Event ID: 547, FB ID: 222 – Chemical selection process, effects of discharges	Yes
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Marine Order 91 – Marine pollution prevention – oil (as relevant to vessel class) Marine Order 95 – Marine pollution prevention – garbage (as appropriate to vessel class) Marine Order 96 – Marine pollution prevention – sewage (as appropriate to vessel class) Acceptable levels defined in the NERA (2018b) Environment Plan Reference Case for Planned Discharge of Sewage, Putrescible Waste and Grey Water.	Yes
Acceptability Statement	Decision-type A impacts are considered acceptable if the requirements in Table 6-44 can be demonstrated and if the level of residual impact has a consequence severity less than Major (4). Further to this, following completion of the impact assessment process, the impact of planned operational discharges on receptors is acceptable because: • The area of impact, and therefore the scale of the impact, is predicted to be small. • No serious or irreversible damage to receptors is predicted. • Impacts are predicted to be localised and temporary, with no long-term population-level impacts on productivity or viability. • Given that no long-term population-level impacts on productivity or viability are predicted, planned operational discharges are not identified as, or predicted to be, a threat to the sustainability of commercial fisheries within the area. • The temporary, small-scale and reversible impacts associated with planned operational discharges are considered to be of an acceptable level given the existing condition and assimilative capacity of the receiving environment, and • Planned operational discharges do not have the potential to result in long-term, serious, irreversible or cumulative impacts, with limited potential for successive, additive or synergistic impacts when considered in relation to other significant activities or projects over temporal and spatial scales.		

Defined Acceptable Levels		Predicted Impact Level	Is predicted impact below defined acceptable level?
Source	Level		
	The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the impacts of planned operational discharges on all identified receptors. Based on the above evaluation, impacts associated with planned operational discharges meet the defined acceptable levels.		

6.9.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with planned operational discharges from the Otway Exploration Drilling Program are:

- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO7: No unplanned objects, emissions or discharges to sea or air.
- EPO10: No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

7. Environmental Risk Assessment

7.1. Overview

This section of the Environment Plan (EP) documents ConocoPhillips Australia's assessment of the environmental risks associated with unplanned events that may occur during the Otway Exploration Drilling Program, appropriate to the nature and scale of each, in accordance with the methodology described in Section 5. This section also details the evaluation of control measures (being systems, procedures, personnel or equipment) to reduce risks to as low as reasonably practicable (ALARP); compares residual risks to the defined acceptable levels; and establishes Environmental Performance Outcomes (EPOs) which represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve.

Environmental Performance Standards (EPS) and measurement criteria associated with each of the identified control measures are provided in Section 9.

The established context of each risk is summarised in Appendix A.

7.2. Loss of Materials or Waste Overboard

7.2.1. Hazard

Small quantities of hazardous and non-hazardous materials are used during routine vessel and MODU operations, and consequently result in waste generation which requires handling and storage on vessels and the MODU. Non-hazardous materials could be accidentally dropped or disposed overboard due to overfull bins, crane incidents or improper storage or handling, while hazardous waste may be accidentally dropped or lost overboard as a result of leaks, overfilling of tanks or emergency disconnection of hoses.

7.2.2. Environmental Impacts

In the event of a loss of material or waste overboard, environmental impacts that may occur, are:

- Change in water quality, and
- Change in habitat.

A change in water quality or a change in habitat can result in:

- Injury/mortality to fauna, and
- Change to the functions, interests or activities of other marine and coastal users.

7.2.3. Source of Risk

The Otway Exploration Drilling Program will use seabed survey vessels within operational areas, and a MODU and support vessels within drilling areas, during the exploration program. Small quantities of hazardous and non-hazardous materials are used during routine operations, and consequently result in waste generation.

Vessel and MODU operational procedures are in place to ensure solid and liquid hazardous and non-hazardous wastes are appropriately handled and stored. Waste will be stored on seabed survey vessels and will be offloaded from the MODU to a support vessel, for transfer to port facilities and safe disposal at an onshore licensed facility. Materials and wastes may be accidentally discharged overboard as a result of handling and transport procedural non-compliances, human error or during rough seas where items roll off or blow off the deck into the marine environment.

7.2.4. Defining the Environment that May Be Affected (EMBA)

Table 7-1 describes the basis for defining the EMBA for the potential loss of materials or waste overboard, including relevant sources of information and resultant spatial extent.

Table 7-1: EMBA for the loss of materials or waste overboard

Aspect	EMBA	Basis of EMBA	Sources	Spatial Extent
Loss of materials or wastes overboard	Operational Areas	Extent of EMBA is limited to the boundary of the petroleum activity, which will be located entirely within operational areas	Direct impact limited to defined boundaries of petroleum activity.	Operational Areas

7.2.5. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of risks associated with loss of materials or waste overboard, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

Receptors sensitive to the loss of materials or waste overboard are those which interact with the sea surface and seabed immediately below the exploration activities, i.e. benthic species, fish, marine reptiles, birds and marine mammals; as well as other marine users where the loss represents a potential navigational hazard, and the cultural environment.

7.2.6. Evaluation of Environmental Risks

7.2.6.1. Ecological Receptors

A loss of materials or waste overboard can cause a change in water quality, a change in benthic habitat, or may lead to injury or death to individual marine fauna through ingestion or entanglement.

The Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Ocean (DoEE 2018b) details harmful marine debris impacts on a range of marine life, including protected species of birds, sharks, turtles and marine mammals. Harmful marine debris refers to all plastics and other types of debris from domestic or international sources that may cause harm to vertebrate marine wildlife. This includes land sourced plastic garbage (e.g. bags, bottles, ropes, fibreglass, piping, insulation, paints and adhesives), derelict fishing gear from recreational and commercial fishing activities and ship-sourced, solid non-biodegradable floating materials lost or disposed of at sea.

Marine fauna including cetaceans, turtles and seabirds can be severely injured or die from entanglement in marine debris, causing restricted mobility, starvation, infection, amputation, drowning and smothering (DoEE 2018b). Seabirds entangled in plastic packing straps or other marine debris may lose their ability to move quickly through the water, reducing their ability to catch prey and avoid predators, or they may suffer constricted circulation, leading to asphyxiation and death. In marine mammals and turtles, this debris may lead to infection or the amputation of flippers, tails or flukes (DoEE 2018b). Plastics have been implicated in the deaths of a number of marine species including marine mammals and turtles, due to ingestion. Turtles and seabirds in particular are often subject to such impacts, with entanglement being a relatively common occurrence and plastic waste being mistaken as food (i.e. plastic bags as jellyfish).

It is recognised that fishing gear (ropes and nets made from synthetic fibres), balloons and plastic bags are the biggest entanglement threat to marine fauna, and plastic bags and utensils are the biggest ingestion risk for seabirds, turtles and marine mammals (Wilcox et al. 2016, cited in DoEE 2018b). During the Otway Exploration Drilling Program, any material or waste lost overboard, creating a risk of ingestion or entanglement for marine fauna, is expected to be largely associated with accommodation facilities (i.e. food packaging), with very limited amounts of wastes/materials posing high risk of entanglement (i.e. rope, netting, packaging straps). Given the limited duration, number and size of seabed survey vessels, MODU and support vessels involved in the petroleum activity, the opportunity for loss of materials or wastes is minimal. Whilst there will be bulk transfer of wastes and chemicals at sea, well-practiced procedures will reduce the likelihood of loss of materials or waste entering the marine environment.

The following management plans and conservation advice identify marine debris as a threat:

- National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e)
- Recovery Plan for Marine Turtles in Australia (CoA 2017)
- Wildlife Conservation Plan for Seabirds (DCCEEW 2020)
- Threat Abatement Plan for the impacts of marine debris on vertebrate wildlife of Australia's coasts and oceans (DoEE 2018b)
- Conservation Management Plan for the Blue Whale 2015 – 2025 (DoE 2015)
- Conservation Management Plan for the Southern Right Whale 2011 –2021 (DSEWPaC 2012b)
- Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) (DSEWPaC 2013c)
- Commonwealth Conservation Advice on the Leatherback turtle (*Dermochelys coriacea*) (DCCEEW 2008)

Foraging BIAs for several albatross and petrel species, Australasian gannet, the short-tailed and wedge-tailed shearwater overlap the operational areas. However, no habitat critical to the survival of birds occur within the operational area.

Three marine turtle species (or species habitat) may occur within the operational areas, though no BIAs or critical habitat to the survival of the species were identified.

Four threatened whale species (or species habitat) may occur within the operational area. Foraging behaviours were identified for three of these species (sei, blue, fin whales). The operational areas intersect a foraging BIA for the pygmy blue whale and the migration BIA for the southern right whale.

A distribution and foraging BIA for the white shark has been identified within the operational areas. The VIC/P79 operational area overlaps the total white shark foraging BIAs by <0.22%. White shark presence within the operational areas is expected to be transitory in nature. Recovery Plan for the White Shark (DSEWPaC 2013a) does not identify waste or marine debris as a threat.

Unplanned seabed disturbance from dropped objects are most likely to be from small handheld tools, chains, anchors, pipes and chemical containers (objects <5 m^2 in size). Seabed disturbance resulting from these dropped objects is likely to be very localised and may result in a change in habitat through localised sedimentation and possible permanent modification of the seabed. In the event larger objects are lost overboard and are not retrievable (e.g. by crane or ROV), these items may permanently cause disturbance to small areas of seabed, resulting in localised loss of benthic assemblages and in turn impacting benthic fauna in the immediate vicinity.

Seabed substrates can rapidly recover from temporary and localised impacts. The benthic habitats (described in Chapter 4) in the operational areas are broadly similar to those elsewhere in the region (e.g., extensive sandy seabed), so impacts to small and very localised areas of seabed are not expected to result in the long-term loss of benthic habitat or species diversity or abundance. Where a dropped object cannot be retrieved it is likely that the object will be colonised and will therefore offset any loss of local benthic habitat.

A EPBC PMST report for the operational areas did not identify any threatened marine invertebrate species or benthic habitats. The extent of the area of impact is predicted to immediately adjacent to seabed survey sites, or the MODU or support vessels within the drilling areas.

The consequence of losses of materials or wastes overboard causing injury / mortality to individual fauna has been assessed as **Minor (2)**, based on:

- Materials or waste accidently released to the marine environment may lead to injury or death to individual marine fauna through ingestion or entanglement.
- The Recovery Plans for species identified as present in the operational areas identify marine pollution, entanglement or ingestion as a key threat including the following:
  - National Recovery Plan for albatross and petrels (2022) (DCCEEW 2022e) identify marine pollution is a threat, however no habitat critical to the survival overlap operational area.
  - Conservation Management Plan for the blue whale and southern right whale (DoE 2015; DSEWPaC 2012b) identify marine debris as a threat, but there are no conservation management actions identified.
  - The Recovery Plan for Marine Turtles in Australia (CoA 2017) identified marine debris as a threat however no BIAs or critical habitat to the survival of the species were identified.
- The loss of materials and waste overboard during the petroleum activity is considered to result in short-term and localised consequences to marine fauna at an individual level and, given the seabed survey areas and drilling areas represent a small portion of the total BIA areas for species identified, no population level impacts are expected.

- Species identified with BIAs overlapping the EMBA are predicted to be largely transitory or present for short periods.
- Vessel management systems addressing dropped object, waste storage and chemical handling and storage are well practiced and well understood.
- An unplanned release of waste will be of a very low volume if an incident occurs and impacts would be restricted to individual fauna and unlikely to impede the recovery of a protected species.
- DCCEEW (2012b) reports that there have been 104 records of cetaceans in Australian waters impacted by plastic debris through entanglement or ingestion since 1998 (humpback whales being the main species). However, the Threat Abatement Plan (2018) suggests that most marine plastic debris are associated to shipping and fishing activities (fishing gear, balloons and plastic bags).
- Waste will be handled in accordance with AMSA Discharge Standards and respective vessel Garbage Management Plans (GMP). Given this, any waste lost overboard would be in minimal quantities.

The likelihood of losing waste or other materials overboard is assessed as **Remote**, given that it has been heard of within the offshore oil and gas industry. The consequence of a loss of material or waste overboard is not expected to affect an entire population and appropriate management systems are in place to reduce the likelihood of material/waste being lost due to non-human factors (i.e. during weather events).

7.2.6.2. Socio-economic Receptors

In the event a buoyant object is accidentally released and cannot be recovered by a vessel, the buoyant object may present a navigation or entanglement hazard to commercial fishers and other marine users in the region. Further the buoyant object may become non-buoyant overtime and sink to the seabed, where it may present a snagging hazard on the seafloor for commercial trawling activities.

The extent of the area of impact is predicted to be immediately adjacent to the seabed survey areas, MODU or support vessels, with the duration of this risk being limited to the time taken to recover lost object/material or to notify relevant authorities (with risk limited to duration of petroleum activity). The consequence of loss of materials or waste overboard resulting in a change to the functions, interests or activities of commercial fishers has been assessed as **Negligible (1)**, based on:

- Buoyant or non-buoyant dropped objects, that may pose a threat to commercial fishers and other users' infrastructure, are limited to small objects (i.e. waste bins). This is considered unlikely to present a significant hazard based on limited exposure and clear lines of communication with other marine users.
- There is commercial shipping through the operational area, but otherwise use is relatively limited. Any impacts would be restricted to individual marine users.
- The seabed survey areas and drilling areas, where most activities will be occurring, represent a small portion of the total available fishing area available to commercial fishers and is expected to only affect individual fishers rather than entire fleet and fishing season.
- Vessel procedures are in place to reduce the risk of a loss of material or waste overboard are well understood and well-practiced in marine industries.

The likelihood of losing waste or other materials overboard is assessed as **Remote**, given that it has been heard of within the offshore oil and gas industry. The consequence of a loss of materials or waste overboard is not expected to affect an entire fishery fleet or season and vessels will have appropriate management systems in place to reduce the likelihood of material/waste being lost due to non-human factors (i.e. during weather events).

7.2.6.3. Cultural Environment

As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the operational areas overlap Sea Country for the duration of the activity.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by a loss of materials or waste overboard.

Loss of materials or waste overboard is assessed as having a minor consequence to ecological environment of offshore waters, with no long-term or population level impacts predicted. It is therefore predicted to have **Minor (2)** consequence to associated cultural values within the operational areas, with a **Remote** likelihood of occurrence, given that it has been heard of within the offshore oil and gas industry.

7.2.7. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the benefit gained.

For the assessment of ALARP, **Decision Context A** has been applied:

- Impacts from risk are well understood.
- Activity will not result in serious or irreversible environmental damage.
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower-order risks are managed to ALARP and acceptable levels.

Table 7-2 documents the assessment of control measures for loss of materials or waste overboard.

Table 7-2: Control measures for loss of materials or waste overboard and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
CM02: Vessel and MODU Operating Procedures	In accordance with Marine Order Part 95 (Marine pollution prevention — garbage) 2013 which gives effect to MARPOL Annex V: • Waste with potential to be windblown shall be stored in covered containers.
CM02: Vessel and MODU Operating Procedures CM011: Procurement Vetting Process	In accordance with Marine Order 42 (Carriage, stowage and securing of cargoes and containers) 2016, where relevant, to ensure cargo is packed, loaded, stowed and secured throughout each voyage.
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).

Additional Controls Assesses – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Reduction			
All lifting gear used for deployment and retrieval of equipment over the MODU and vessels is load rated for the working load.	Reduces the likelihood of failures resulting in loss of materials or waste overboard	Part of normal operating procedures. All lifting gear used for the deployment and retrieval of equipment over the MODU and vessels will be load rated for the working load to ensure equipment is capable of lifting the loads required and minimise the risk of equipment failing.	Adopt: CM02: Vessel and MODU Operating Procedures
Mitigation			
At least one support vessel will remain with the MODU during drilling activities	If deemed safe and effective to do so, support vessels can assist in the recovery of lost materials or waste.	Risks to vessel personal from recovery operations. Minor costs associated with re-tasking. Environmental benefit outweighs additional cost, where deemed safe and effective.	Adopt: CM02: Vessel and MODU Operating Procedures
Report incidents of lost materials or wastes	Supports awareness of potential for navigational safety risks within operational areas.	Part of normal operating procedures. The recording and reporting of incidents, including those associated with lost equipment is standard in the industry. AMSA ARC and other marine users of the relevant operational area will be notified in the event of loss of materials with potential to affect safe navigation. Environmental benefit outweighs additional cost.	Adopt: CM02: Vessel and MODU Operating Procedures

Residual Risk Ratings			
Receptor	**Consequence**	**Likelihood**	**Residual Risk Rating**
Ecological Receptors	Minor (2)	Remote (2)	Low (RR I)
Socio-economic Receptors	Negligible (1)	Remote (2)	Low (RR I)
Cultural Environment	Minor (2)	Remote (2)	Low (RR I)

ALARP Statement	The decision context has been assessed as Type A and the residual risk ratings are lower order – Low (RR I). The adopted control measures minimise the likelihood and consequence of unplanned loss of materials or waste overboard and are considered effective and appropriate to the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted risks to receptors from unplanned loss of materials or waste overboard associated with the Otway Exploration Drilling Program are reduced to ALARP.

7.2.8. Acceptability Assessment

Table 7-3 compares the predicted risk ratings for loss of materials or waste overboard against the acceptable levels.

Table 7-3: Comparison of defined acceptable levels with risk levels for loss of materials or waste overboard

Defined Acceptable Levels		Predicted Risk Level	Is predicted impact below defined acceptable level?
Source	**Level**		
Principles of ESD	Activities that result in temporary/ reversible, small scale, and/or low intensity environmental damage. Environmental risks have a worst-case ranking of less than Significant (RR III).	Planned activities are not expected to result in a loss of materials or waste overboard. The residual risk ranking is **Low (RR I)**.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Marine fauna injury or death from unplanned discharge of waste if occurred will not: • impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (CoA 2017). • impact the long-term survival and recovery of albatross and giant petrel populations breeding and foraging as per the National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e). • impact the recovery of the blue whale as per the Conservation Management Plan for the Blue Whale (DoE 2015). • impact the recovery of the southern right whale as per the Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b). • impact the recovery of sei, fin whale or humpback whales, covered by conservation advice. The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).	Yes
Biological Ecological Economic Cultural	No unplanned objects, emissions or discharges to sea or air. No death or injury to listed threatened or migratory species, from the activity.	No loss of materials or waste overboard are planned.	Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted control measures as listed above have been assessed to ensure that environmental risks will be of an acceptable level throughout the exploration activity.	Yes

Defined Acceptable Levels		Predicted Risk Level		Is predicted impact below defined acceptable level?
Source	**Level**			
ConocoPhillips Australia Policies	Environmental risks are consistent with environmental policies and processes such that residual environmental risks will be below Significant (RR III).	Likelihood	**Remote**	Yes
		Consequence	**Minor (2)**	
		Residual Risk	**Low (RR I)**	
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to loss of materials or waste overboard have been considered (with more detail provided in Section 3). These include: • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage		Yes
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Legislative and other requirements have been identified and met: • Marine Order 95 – Marine pollution prevention – garbage (as appropriate to vessel class) • Marine Order 42 – securing of cargo • Protection of the Sea (Prevention of Pollution from Ships) Act 1983. • Navigation Act 2012 – Chapter 4 (Prevention of Pollution).		Yes
Acceptability Statement	Decision-type A risks are considered acceptable if the requirements in Table 7-3 can be demonstrated and if the level of residual risk has a rating less than Significant (RR III)). Further to this, following completion of the risk assessment process, the impact of loss of materials or wastes from drilling and vessel operations on receptors is acceptable because: • Good practice controls are clearly defined and have been implemented. • Adequate procedures and processes are in place to prevent a loss of materials or waste. • The activity will be managed in accordance with relevant ConocoPhillips, Commonwealth, international, and Industry standards, guidelines, and requirements. • No serious or irreversible damage to receptors is expected if a loss does occur. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the risks of unplanned losses on identified receptors. Based on the above evaluation, the risks associated with the loss of materials or wastes overboard meet the defined acceptable levels.			

7.2.9. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with the loss of materials or waste overboard from the Otway Exploration Drilling Program are:

- EPO3: No death or injury listed threatened or migratory species from the activity.
- EPO7: No unplanned objects, emissions or discharges to sea or air.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

7.3. Minor Loss of Containment

7.3.1. Hazards

An accidental release of small volumes of chemicals or hydrocarbons could occur due to a minor loss of containment (minor LOC) during:

- MODU operations
- Vessel operations, and
- ROV operations.

The engines and equipment used on the MODU and vessels will require Marine Diesel Oil (MDO) or comparable fuel types, a variety of hydraulic fluids and lubricating oils for efficient operation and maintenance of moving parts. The activity may also require the use of small amounts of miscellaneous chemicals (e.g. brine, cleaning agents, stored chemicals, paint materials, cement, subsea-control fluids).

These hydrocarbons and chemicals are either located within equipment or held within storage containers during the activity. An accidental release of hydrocarbons and chemicals could occur during the activity and could potentially be released into the marine environment.

An accidental minor LOC could result from:

- Deck spills associated with e.g. handling error of hydrocarbons and chemicals or failure in containment measures (e.g. bunding, fastening or storage)
- Dropped objects damaging equipment (e.g. hoses, pipes, tanks etc.)
- Bulk transfers – hose failure/leak during transfer of bulk product between vessel and MODU
- Hydraulic line failure from equipment
- Loss of primary containment (e.g. drums, tanks, IBCs) from storage and containment errors
- Slip joint packer failure at the surface or within the water column, and
- ROV failure – including oil seal, hydraulic system hose or quick disconnect system failures.

Hydrocarbon releases which are not considered minor, i.e. larger volume MDO spills from vessel collisions, Loss of Well Control (LOWC) associated with drilling activities and planned discharges from drilling and operational activities, are addressed separately in Sections 7.6, 7.7, 6.9 and 6.8 respectively.

7.3.2. Environmental Impacts

Small volumes of chemicals or hydrocarbons released to the marine environment will result in a change in water quality that can cause potential impacts, including:

- Injury / mortality to fauna (i.e. through localised chemical toxicity)
- Change in fauna behaviour
- Change in ecosystem dynamics, and
- Changes to cultural environment.

7.3.3. Defining the Environment that May Be Affected (EMBA)

Table 7-4 describes how the EMBA has been defined for the receptors that have been identified to be potentially impacted by a minor LOC.

Table 7-4: EMBA for a minor LOC

Aspect	EMBA	Basis of EMBA	Source	Spatial extent
Accidental release – Minor Loss of Containment (LOC) (chemicals and hydrocarbons)	Operational Areas	Accidental release of small volumes of hydrocarbon or chemicals from MODU, vessel and/or ROV operations or slip joint packer failure could occur on the surface or within the water column, in the operational area.	Small volumes (<50 m^3) of chemicals and hydrocarbons will quickly dissipate to below detectable levels by the well mixed, high energy offshore environment.	Operational Areas.

7.3.4. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of risks associated with minor LOC, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

A minor LOC of hydrocarbons or chemicals could impact water quality and ecological receptors that are slow moving or stationary, which may be of cultural significance. Large pelagic species, such as cetaceans, fish, sharks, and marine turtles, are all highly mobile and transient and are unlikely to remain within the immediate vicinity of the affected area long enough to be impacted.

Minor LOC is not predicted to affect socio-economic receptors given the localised, short-term and recoverable nature of the environmental impacts.

7.3.5. Evaluation of Environmental Risks

The potential consequence of a minor LOC of hazardous substances within the operational areas is limited to a localised and temporary change in water quality within the immediate vicinity of the release.

The maximum credible volume applied to the risk consequence evaluation in this section, as suggested by AMSA (2015), is based on a failure of dry-break couplings over approximately 15 minutes when under continuous supervision, during a fuel transfer at approximately 200 m^3/h (based on other operations). This equates to an instantaneous spill of 50 m^3.

Based on modelling conducted for worst-case MDO release (see Section 7.6), it is predicted that about 6.0% of the MDO mass would evaporate within the first 12 hours; a further 34.6% would evaporate within the first 24 hours; and an additional 54.4% would evaporate over several days. Approximately 5% (by mass) of MDO will not evaporate but will decay slowly over time.

7.3.5.1. Physical and Ecological Environment

A minor LOC of light hydrocarbon fuel, such as MDO, is expected to disperse and spread rapidly. Light hydrocarbons are highly volatile and will evaporate quickly. Modelling results for larger quantities of MDO (350 m^3) indicate that released MDO will rapidly disperse and thin below the conservative moderate environmental impact threshold of 10 g/m^2 for floating oil. The environmental effects from small volumes released during a minor LOC incident are predicted to be temporary and localised on the sea surface near the source. The exposure timeframe is predicted to be short, particularly for mobile cetaceans, pelagic fish and marine reptiles, given that light hydrocarbons will rapidly evaporate.

The most susceptible receptors to impacts from a minor LOC within the marine environment are expected to be passive or low mobility fauna such as plankton, including both invertebrate and fish larvae. Plankton distribution is largely determined by local prevailing wind and tide driven current, and subsequently the potential for population level effects is limited due to plankton having a widespread distribution, high natural mortality rate, rapid population growth rates and anticipated mixing from both inside and outside of the impacted region (Huntley and Lopez, 1992; Richardson et al, 2017).

Hydraulic and lubricating oils are medium oils with light to moderate viscosity. These are known to be slightly more viscous than MDO; however, they are predicted to behave similarly if released into the marine environment. The spreading and dispersion rate will be slightly slower; however, overall, they will spread and dissipate quickly, particularly in high sea states.

Given the highly dispersive waters found within the Otway Basin, the extent of the water column and the relatively small potential volumes associated with a minor LOC, rapid dilution is predicted, and concentrations are not expected to persist for periods of time where impacts would occur.

The consequence severity of a minor LOC on physical and ecological receptors has been assessed as **Negligible (1)**, and the likelihood is assessed as **Rare (2)**, with the overall level of risk being **Low (RRI),** based on:

- A minor LOC of hydrocarbons or chemicals would cause a reduction in water quality, potentially impacting ecological receptors within the immediate vicinity of the release.
- A minor LOC of hydrocarbons or chemicals is expected to spread and disperse rapidly and not persist within the marine environment.
- MDO, hydraulic and lubricating oils are light to moderate viscosity oils and are expected to disperse and spread rapidly if released into the marine environment (see Section 7.6 for modelling on much larger volumes of MDO).
- No long-term impacts at a population level are expected.
- A minor LOC is not expected to cause serious or irreversible environmental damage, and
- No habitat critical to survival of a species was identified to be impacted by a minor LOC.

7.3.5.2. Conservation Values and Sensitivities

The drilling area may overlap the Zeehan Australian Marine Park (Zeehan AMP) Multiple Use Zone, which provides for a wide range of sustainable activities by allowing those that do not significantly impact benthic (seafloor) habitats or have unacceptable impact on the values of the area. Authorisation is required for activities such as commercial fishing, mining, structure and works, among others.

During consultation feedback was provided that the minor loss of containment risk presented a new, poorly understood and unacceptable risk to the Zeehan Marine Park (Org ID: 524, Wilderness Society, Event ID: 3785, FB ID: 388-390; Org ID:111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 358-360).

The conservation values of the Zeehan marine reserve, which include a variety of seabed habitats that supports animal communities and invertebrates, seabirds, the white shark and migrating blue whales and humpback whales (as outlined in EP Section 4) are not predicted to be affected by a minor LOC, given the extent of the area of impact is predicted to be at the sea surface and within the upper water column immediately adjacent to the spill, within the relevant operational area.

Whilst the South-east Marine Reserves Network states that oil pollution associated with offshore mining operations may be a pressure on the conservation values of south-east marine reserves, the small volumes associated with a minor loss of containment (LOC) are not predicted to have a material impact to water quality or marine fauna as discussed in Section 7.3.5.1. Rapid dilution is predicted with environmental effects during a minor LOC incident predicted to be temporary and localised on the sea surface near the source and no impacts to ecological integrity or biodiversity conservation.

The impacts from an accidental release of small volumes of chemicals or hydrocarbons due to a minor loss of containment are well understood, with the assessment of dispersion and evaporation rates for minor spills is based on oil spill modelling conducted specifically for the Otway Exploration Drilling Program (with additional detail provided in section 7.6) and control measures are assessed in Table 7-5 below.

The consequence severity of a minor loss of containment on conservation values and sensitivities has been assessed as **Negligible (1)**, and the likelihood is assessed as **Rare (3)**, with the overall level of risk being **Low (RRI)** based on:

- A minor LOC of hydrocarbons and chemicals would cause a reduction in water quality, potentially impacting passive of low mobility ecological receptors within the immediate vicinity, with no long-term or population level impacts.
- A minor LOC of hydrocarbons or chemicals is expected to spread and disperse rapidly and not persist within the marine environment.
- A minor release of hydrocarbons or chemicals may be detectable in the vicinity of the release but will not result in a significant reduction in key values and sensitivities.

7.3.5.3. Socio-economic Receptors

During consultation, feedback was provided regarding the potential for spilled substances to degrade water quality, with flow on effects for hatchery operations (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 323-327, 329, 330). The potential consequence of a minor LOC of hazardous substances within the operational areas is limited to a localised and temporary change in water quality within the immediate vicinity of the release. Given the distances to coastal seawater inlets, no impacts are predicted to nearshore water quality.

7.3.5.4. Cultural Environment

As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the operational areas overlap Sea Country for the duration of the activity.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by a minor loss of containment.

Minor loss of containment is assessed as having a Low (RRI) risk level to physical and ecological environments and conservation values and sensitivities in offshore waters, with no long-term or population level impacts predicted. They are therefore predicted to pose a **Low (RRI)** risk to associated cultural values within the operational areas.

7.3.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context A** has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower order risks are managed to ALARP and acceptable levels.

Table 7-5: Control measures for minor loss of containment and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
CM01: Marine Assurance Process	A documented Preventative Maintenance System (PMS) will be in place for equipment on the MODU, vessels and ROV that provides a status on the maintenance of equipment and the manufacturer's specification for maintenance procedures.
CM02: Vessel and MODU Operating Procedures	In accordance with MARPOL Annex I and AMSA MO 91 [Marine Pollution Prevention – oil], a Shipboard Marine Pollution Emergency Plan (SMPEP) or Shipboard Oil Pollution Emergency Plan (SOPEP) (according to class) is required to be developed based upon the Guidelines for the Development of Shipboard Oil Pollution Emergency Plans, adopted by IMO as Resolution MEPC.54(32) and approved by AMSA. To prepare for a spill event, the SMPEP/SOPEP details: • Response equipment available to control a spill event. • Review cycle to ensure that the SMPEP/SOPEP is kept up to date. • Testing requirements, including the frequency and nature of these tests. • In the event of a spill, the SMPEP/SOPEP details: o Reporting requirements and a list of authorities to be contacted. o Activities to be undertaken to control the discharge of hydrocarbon. o Procedures for coordinating with local officials. Specifically, the SMPEP/SOPEP contain procedures to stop or reduce the flow of contaminants to be considered in the event of a release.
	Bunkering/Bulk Liquid Transfer Procedure: Bunkering and bulk liquids will be transferred in accordance with Bunkering/Bulk Liquids Procedure(s) to reduce the risk of an unintentional release to sea during transfer. The procedures include standards for: • Certified equipment with checked integrity (e.g. hose and valves). • Transfer process (e.g. safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details)
	Spill Containment Equipment: The contractor(s) management system will include provision to maintain spill containment and clean-up equipment aboard the MODU / vessel to prevent releases to the marine environment.
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).

CM12: General and Hazardous Chemical Management Procedures	Chemical management procedures for general and hazardous chemicals and hydrocarbons, including requirements for: • Chemical selection process • Safety data sheet (SDS) available for all chemicals to aid in the process of hazard identification and chemical management. • Storage, handling and use • Deck drain management • Inspections • Non-compliances and incidents
CM13: NOPSEMA accepted Oil Pollution Emergency Plan (OPEP)	Under the OPGGS(E)R, NOPSEMA require that the petroleum activity have an accepted Oil Pollution Emergency Plan (OPEP) in place before the activity commences. In the event of a minor LOC, the OPEP will be implemented if required to support the implementation of SMPEPs and SOPEPs. (Org ID: 580, Abalone Council Victoria, Org ID: 588, Western Abalone Divers Association, Event ID: 4153, FB ID: 455).

Additional Controls Assessed – ALARP Assessment

Control	Benefit Analysis	Cost Analysis	Control Adopted?
Reduction			
Mandatory closed drain system to prevent deck drainage discharged overboard.	Reduced impacts to the marine environment by preventing release of contaminants where the contractor management system includes the lock-out of overboard discharge drains.	Increased cost due to treatment system required, modifications to MODU and vessels, storage space required for containment of drained liquids. Evaluation of trade-offs indicates increased transfers to vessels for onshore disposal will result in increased vessel movements (noise), fuel usage, crane movements and additional safety risks during transfers. The benefit is considered grossly disproportionate to the cost, trade-offs and introduced risks.	Reject.

Residual Risk Ratings

Receptor	Consequence	Likelihood	Residual Risk Rating
Physical and Ecological Receptors	Negligible (1)	Rare (3)	**Low (RR I)**
Conservation Values and Sensitivities	Negligible (1)	Rare (3)	**Low (RR I)**
Socio-economic Receptors	Negligible (1)	Rare (3)	**Low (RR I)**
Cultural Environment	Negligible (1)	Rare (3)	**Low (RR I)**

ALARP Statement	The decision context has been assessed as Type A and the residual risk ratings are lower order – Low (RR I). The adopted control measures minimise the likelihood and consequence of minor loss of containment and are considered effective and appropriate to the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific physical, ecological and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment. However, none provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted risks to receptors from unplanned minor loss of containment associated with the Otway Exploration Drilling Program are reduced to ALARP.

7.3.7. Acceptability Assessment

Table 7-6 compares the predicted impact levels for minor loss of containment against the acceptable levels.

Table 7-6: Comparison of defined acceptable levels with risk levels for minor loss of containment

Defined Acceptable Levels		Predicted Risk Level	Is predicted risk below defined acceptable level?
Source	**Level**		
Principles of ESD	Activities that result in temporary / reversible, small scale, and/or low intensity environmental damage. Environmental risks have a worst-case ranking of less than Significant (RR III).	Planned activities are not expected to result in a minor loss of containment. The residual risk ranking is **Low (RR I)**.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	A minor loss of containment (hydrocarbons or chemicals) into the marine environment will not impact the recovery or long-term survival of species in accordance with Conservation/ Recovery Plans.	Yes.
Biological Ecological Economic Cultural	No unplanned objects, emissions or discharges to sea or air. No death or injury to listed threatened or migratory species, from the activity. No substantial or unrecoverable change in water quality which may adversely impact biodiversity, ecological integrity, social amenity, cultural values or human health.	Minor loss of containment is not planned to occur.	Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted controls measures as listed above have been assessed to ensure that environmental risks will be of an acceptable level throughout the Otway Exploration Drilling Program.	Yes
ConocoPhillips Australia Policies	Environmental risks are consistent with environmental policies and processes such that residual environmental risks will be below Significant (RR III).	**Likelihood**: Rare (3) **Consequence**: Negligible (1) **Residual Risk**: **Low (RR I)**	Yes
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to minor LOC have been considered (with more detail provided in Section 3). These include: • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 323-327, 329, 330 – Impacts to intakes • Org ID: 524, Wilderness Society, Event ID: 3785, FB ID: 388-390, Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 358-360 – Spill risk in Zeehan Marine Park	Yes

Defined Acceptable Levels		Predicted Risk Level	Is predicted risk below defined acceptable level?
Source	Level		
		• Org ID: 111, Australian Marine Conservation Society, Event ID: 4153, FB ID: 455 – Spill response plan • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type A risks are considered acceptable if the requirements in Table 7-6 can be demonstrated and if the level of residual risk has a rating less than Significant (RR III)). Further to this, following completion of the risk assessment process, the impact of a minor LOC on receptors is **acceptable** because: • The impacts associated with a minor LOC are well known. • Good practice controls are clearly defined and will be implemented. • Adequate procedures and guidelines are in place to ensure the correct handling and transfer of hydrocarbons and chemicals are well understood. • The activity will be managed in accordance with relevant ConocoPhillips, Commonwealth, international and Industry standards, guidelines and requirements. • No serious, irreversible long-term or population-level damage to receptors is expected if a minor LOC does occur. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the risk of an unplanned minor LOC on identified receptors. Based on the above evaluation, the risks associated with minor LOC meet the defined acceptable levels.		

7.3.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with a minor loss of containment from the Otway Exploration Drilling Program are:

- EPO3: No death or injury listed threatened or migratory species from the activity.
- EPO7: No unplanned objects, emissions or discharges to sea or air.
- EPO10: No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

7.4. Interaction with Marine Fauna

7.4.1. Hazard

The presence of moving or stationary MODU, vessels, aircraft and/or other surface infrastructure in the marine environment may result in unplanned interactions with marine fauna, such as vessel collisions (often referred to as a 'ship strike') and aircraft collisions.

Collisions with fauna may occur during the following activities:

- MODU transit, towing and positioning,
- Vessel operations, and
- Aircraft operations.

7.4.2. Potential Environmental Impacts

Interaction with marine fauna can result in environmental impacts including:

- Injury / mortality to fauna, and
- Change in fauna behaviour.

7.4.3. Source of Risk

Aircraft, MODU and vessel activities within the operational areas have the potential to interact with marine fauna resulting in injury / mortality or a change in fauna behaviour.

Seabed surveys will be conducted by 1 to 2 vessels, the MODU may self-propel or be towed by support vessels into position, and up to three vessels will be used to support drilling activities during the exploration program. Vessels will either be stationary or operating at slow speeds (typically 4-5 knots) while undertaking seabed surveys or activities within the drilling area. Within the operational areas the vessels or MODU will not exceed 10 knots. The transit of the MODU and vessels outside of operational areas is outside the scope of this EP and is managed under the Commonwealth Navigation Act 2012.

Helicopter operations may occur several times per week to support drilling activities and are considered part of the petroleum activity once within the drilling area.

Disturbance to fauna from noise and light emissions associated with exploration activities is addressed separately in Section 6.4, 6.6 and 6.7.

During public comment, feedback was received regarding the risk presented to grounded seabirds by open pits containing liquids on offshore platforms. As the proposed MODU is a harsh weather rig designed for North Sea conditions, the pit rooms are fully enclosed with additives transferred internally within the rig. This design feature effectively eliminates the potential for interactions with grounded seabirds. [Paragraph added in response to Matter: B07].

7.4.4. Defining the Environment that May Be Affected (EMBA)

Table 7-7 describes how the EMBA has been defined for the identification of environmental values and sensitivities, i.e. receptors, that may be impacted by interactions with the MODU, vessels and aircraft.

Table 7-7: EMBA for potential interactions between MODU/vessels/aircraft and marine fauna

Aspect	EMBA	Basis of EMBA	Source	Spatial Extent
MODU, Vessel and/or Aircraft	Operational areas	The risk to marine fauna is posed by the physical presence	National Strategy for Reducing Vessel Strike on Cetaceans and other	Operational areas

collision with marine fauna		of the MODU, or a moving vessel or aircraft. The transit of the MODU and vessels outside the operational areas is outside the scope of this EP and is managed under the Commonwealth Navigation Act 2012.	Marine Megafauna (DoEE 2017a) identified relevant risks of vessel strike.	

7.4.5. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of risks associated with interaction with marine fauna, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

Receptors which are the most susceptible to vessel collisions are typically characterised as large or slow-moving marine fauna that commonly dwell near the surface and frequent areas associated with a high level of vessel traffic. Species which have either a limited, threatened or geographically concentrated population are also a concern. Cetaceans and marine turtles have been identified as vulnerable to vessel collisions within the National Strategy for Mitigating Vessel Strike of Marine Megafauna (DoEE 2017a). However, other species can also be at risk of a vessel collision (e.g. pinnipeds and sharks). Birds moving through the operational areas are at risk of interaction with surface infrastructure, such as the derrick on the MODU, or a collision with aircraft when in use.

The EPBC Act PMST report for the operational areas listed 28 species of cetaceans that occur within the operational area. Four have a EPBC threatened status, with two listed as Endangered (blue whale (*Balaenoptera musculus*) and southern right whale (*Eubalaena australis*)) and two listed as Vulnerable (fin whale (*Balaenoptera physalus*) and sei whale (*Balaenoptera borealis*). The EPBC Act PMST report identified a foraging (annual high use area) and distribution BIA for the pygmy blue whale, and a migration BIA for the southern right whale (see EP Section 4.6.9). Further, ConocoPhillips Australia has collected data during marine mammal surveys since 2021 which was used to inform the assessment of likely species and abundance in the area (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 49; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 363; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 393; Org ID: 593, , Event ID: 2558, FB ID: 113).

Three species of marine turtles were identified with the potential to occur within the operational areas by the EPBC Act PMST report. All have an EPBC threatened status, with two listed as Endangered (loggerhead turtle (*Caretta caretta*) and leatherback turtle (*Dermochelys coriacea*)) and one listed as Vulnerable (green turtle (*Chelonia mydas*)). ConocoPhillips Australia recorded the presence of a single leatherback turtle within T/49P during aerial surveys in 2022 (Appendix P). The EPBC Act PMST report did not identify any known BIAs, nesting or inter-nesting areas identified as habitat critical to the survival of marine reptiles within the operational area.

The EPBC Act PMST report listed three species of pinnipeds to occur with the operational areas. One has a EPBC threatened status of Endangered (Australian Sea-lion (*Neophoca cinerea*)). The other two do not have a EPBC threatened status: New Zealand fur-seal (*Arctocephalus forsteri*), and the

Australian fur-seal (*Arctocephalus pusillus*). No BIAs or habitat critical to the survival of the species were identified for any species of pinniped.

A total of 34 bird species were identified to occur within the operational areas by the EPBC Act PMST report. Of these, 30 are listed as marine and/or migratory species and 27 have an EPBC threatened status, including 3 Critically Endangered (far eastern curlew (*Numenius madagascariensis*), the orange-bellied parrot (*Neophema chrysogaster*), the curlew sandpiper (*Calidris ferruginea*)), with 6 listed as Endangered and 18 as Vulnerable. 11 species were identified to have foraging BIAs within the operational areas: antipodean (*Diomedea exulans antipodensis*), black-browed (*Thalassarche melanophris*), Bullers (*Thalassarche bulleri*), Campbell (*Thalassarche melanophris impavida*), Indian yellow-nosed (*Thalassarche chlororhynchos bassi*), shy (*Thalassarche cauta cauta*), and wandering albatross (*Diomedea exulans (sensu lato)*), wedge-tail (*Ardenna pacifica*) and short-tailed shearwater (*Ardenna tenuirostris*), and white-faced (*Pelagodroma marina*) and common-diving petrel (*Pelecanoides urinatrix*).

The EPBC Act PMST report also identified one species of shark with an EPBC threatened status, being the white shark (*Carcharodon carcharias*)). The known distribution BIA for the white shark was identified to overlap the operational areas. No other BIAs or habitat critical to survival were identified for any species of fish or shark.

7.4.6. Evaluation of Environmental Risks

The National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna identifies that the consequence of a vessel strike can range from low impact to extreme depending on the circumstance (DoEE 2017a). Injuries sustained from vessel collisions are not always lethal. However, many incidents which may not result in direct mortality often result in injuries to the back of the animal and the dorsal fin, resulting in a loss of blood, possible infection, and reduced swimming efficiency, eventually causing an overall reduction in fitness of the individual (van Waerebeek et al. 2006). Jensen and Silber (2003) analysed 292 reported incidents with large cetaceans and identified only seven individuals which appeared to have no signs of injury.

Studies have found that the overall impact and potential fauna mortality in the event of a vessel strike is directly linked to vessel speed, with studies demonstrating an escalation in speed to cause an increase in injury severity to large cetaceans (Vanderlaan and Taggart 2007). Slower moving vessels provide greater opportunity for both fauna and vessel to avoid collision. The most severe injuries have been identified to be caused by vessels travelling faster than 14 knots (Jensen and Silber 2004; Laist et al. 2001). Furthermore, large vessels (>80 m) with modern hull shapes are also correlated with increased injury severity (Laist et al. 2001). Vessel speed may also result in animals, including large whales, being drawn laterally towards the hull of the vessel (Silber et al. 2010).

The behavioural traits of certain species can also make them more vulnerable to vessel and aircraft strike such as slow swimming or flying speed, and the habituation and general lack of awareness of vessel or aircraft noise and the associated danger posed. Some species spend more time at the surface when resting, foraging or mating making them more vulnerable to vessel strike (DoEE 2017a).

7.4.6.1. Ecological Receptors

White Shark

White sharks are highly mobile and expected to have largely transitory presence within the operational areas, therefore, none are expected to be subject to vessel collision. Sharks will exhibit avoidance behaviour from a sound source if it reaches levels that may cause behavioural or physiological effects (see Section 6.6 and 6.6.10), as such the likelihood of getting close enough for a collision is very low.

The operational areas intersect with the known distribution BIA for the white shark which has a Threatened EPBC status. There is limited data regarding strikes to shark species such as white sharks, likely due to lack of collisions being noticed and lack of reporting (Peel et al. 2016).

The extent of the area of risk is predicted to be at the sea surface immediately adjacent to the MODU and vessels within operational areas. The consequence of collisions to white sharks causing an injury / mortality has been assessed as **Minor (2)**, based on:

- Collisions are not listed as a threat within the Recovery Plan for the White Shark (DSEWPaC 2013a).
- MODU and vessel movements in the operational areas will be slow, and the total number of vessels within the operational areas will be a maximum of three at any time.
- The majority of fish species, including sharks, have shown to exhibit avoidance behaviours to noise emissions (see Section 6.6 and 6.7), and
- The consequence of a strike on a single animal is not predicted to affect the overall population.

The likelihood is assessed as **Improbable (1)**, given that movements within the operational areas are expected to be slow and limited. The inherent risk level is therefore **Low (RRI)**.

Birds

Aircraft, MODU and vessel activities within the operational areas have the potential to cause injury / mortality and a change in behaviour to seabirds and migratory birds, specifically species which fly through the operational areas, or spend extended periods of time on the water surface in high vessel traffic areas. The Wildlife Conservation Plan for Seabirds (DCCEEW 2020) recognises that seabirds are known to aggregate around oil and gas platforms in above average numbers due to night lighting, flaring, food concentrations and other visual cues (Wiese et al. 2001). While most interactions are harmless, some can be detrimental and may cause injury or death e.g. from collision or indirectly from depleted body reserves (Ronconi et al. 2015). Bird mortality has been documented due to collision with structures, and interactions with flaring activities (Wiese et al. 2021).

The risk of bird collision with helicopter operations is a safety consideration for flights to and from the MODU. The consequence of a helicopter bird strike varies and is influenced by the individual's seasonal distribution, body mass, flocking and flight behaviour, while the probability of a strike is related to the abundances of different bird species on or near the MODU.

The extent of the area of risk is predicted to be in the air and at the sea surface immediately adjacent the MODU, vessels or aircraft within the operational areas. The consequence of interaction with seabirds causing an injury / mortality has been assessed as **Minor (2)**, based on:

- The National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e) classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction.
- The National Recovery Plan for the Orange-bellied Parrot (*Neophema chrysogaster*) (DELWP 2016) identified as Critically Endangered, lists illuminated structures, and illuminated boats as potential barriers to migration and movement as a main threat (See Section 6.4 for the impacts of light emissions). The operational areas do not overlap the migration route of the orange-bellied parrot and, as such, the activities of the MODU and vessels when undertaking the petroleum activity do not present the same risk as that associated with illuminated structures or illuminated boats within the migration route. Impacts associated with flaring, which will not occur within the migration route but rather may change ambient light in the area, will be temporary and of short duration (120 hours per well).
- 11 species of birds (albatross, shearwaters and petrels) were identified to have foraging BIAs within the operational areas. Given the large distances typically covered by foraging bird species

(see Section 4.6.7) there is a relatively small overlap of the operational areas by the BIAs, and interactions from the activities should not impact foraging behaviours. Further, MODU and vessel movements within the operational areas will be slow, and the total number of vessels within the operational areas will be a maximum of three at any time; and the limited duration and intermittent nature of flaring operations (a maximum of 120 hours in total per well, comprising several short-term flaring events) reduces the likelihood of impacts to birds.
- The consequence of a strike on a single animal is not predicted to affect the overall population.

The likelihood of interactions with birds is assessed as **Remote,** given that it has been heard of within the offshore oil and gas industry and the movements within the operational areas are expected to be slow and flaring activities are limited in duration. The inherent risk level is therefore **Low (RRI)**.

Marine Reptiles

Vessel strikes have been identified as a threat to marine turtles within the Recovery Plan for Marine Turtles in Australia (DotEE 2017b). However, there is a limited amount of available data regarding vessel strike to fauna such as marine turtles; potentially due to a lack of vessel collisions being noticed, and a lack of reporting (Peel et al. 2016).

Marine turtles are most vulnerable to vessel collisions when they are either resting or returning to the surface to breathe. Studies have demonstrated that marine turtles spend limited time at the sea surface, approximately 3% to 6%, with dive times recorded from 15 to 60 minutes (Milton and Lutz 2003). A study on green turtles by Hazel (2009) found that individuals only exposed the dorsal-anterior part of the head above the water surface, and for never longer than two seconds.

Turtles can detect sound in water and will generally move from anthropogenic noise-generating sources, such as vessels, within their detection range (Popper et al. 2014). Studies have shown that the ability of turtles to respond and avoid vessels greatly depends on the speed of the vessel. In general, marine turtles are not able to avoid vessels when they are travelling faster than 4 km/h (2.2 knots) (Hazel et al. 2007). The propagation characteristics of sound within the marine environment make it difficult for marine turtles to identify the direction of the source of vessel noise. Furthermore, individual noise from a vessel may be masked within areas of high vessel and other noise -generating activities use, which is likely to limit the ability of marine turtles to identify and avoid approaching vessels (Hazel 2009).

The extent of the area of risk is predicted to be at the sea surface within the operational areas. The consequence of a collision causing an injury / mortality to marine reptiles (marine turtles) has been assessed as **Minor (2)**, based on:

- The Recovery Plan for Marine Turtles in Australia (CoA 2017) identifies vessel disturbance as a key threat but details that although the outcome can be fatal for individual turtles, boat strike (as a standalone threat) has not been shown to cause stock level declines.
- Three marine turtle species may occur within the operational areas although no BIAs or habitat critical to the survival of the species were identified, and the presence of most species is expected to be of a transitory nature only.
- Vessel and MODU movements in the operational areas will be slow, and there are only up to three exploration vessels in the operational areas at any one time.
- Avoidance behaviour to underwater noise may occur within the operational areas (see Section 6.6 and 6.7.
- The extent of the area of impact is predicted to be immediately adjacent to the MODU and vessels involved in the Otway Exploration Drilling Program, therefore, there will be a relatively small potential area of impact, and
- The consequence of a strike on a single animal is not predicted to affect the overall population.

The likelihood is assessed as **Remote**, given that movements within the operational area are expected to be slow and limited. The inherent risk level is therefore **Low (RRI)**.

Marine Mammals

Vessel collisions have the potential to result in injury/mortality to marine mammals, such as cetaceans and pinnipeds. Cetaceans and pinnipeds are naturally inquisitive species which are often attracted to offshore vessels, e.g. dolphins are commonly reported to 'bow ride'. The reaction of cetaceans to an approaching vessel is variable and unpredictable. Often species remain motionless whilst in the vicinity of a vessel, whereas others have been known to be curious, often approaching ships which have stopped or are slow moving. In general they do not approach, and sometimes actively avoid, faster moving vessels (Richardson et al. 1995). For example, humpback whales have been shown to frequently change course to avoid a vessel after detection (WDCS 2006).

Vessel collisions with cetaceans occur more frequently in areas where high vessel traffic and cetacean habitat coincide (WDCS 2006). Peel et al. (2016) analysed the number of vessel collisions with cetaceans within Australian waters, stating at least 109 vessel collisions have been reported since 1840. However, the paper emphasises a lack of reporting as an issue in confirming exact numbers. Recorded instances of cetacean deaths due to vessel strikes indicate that they are much more likely to be associated with container ships and fast ferries (WDCS 2006).

Peel et al (2016) reviewed vessel strike data (2000-2015) for marine species in Australian waters and identified the following:

- Whales including the humpback (*Megaptera novaeangliae*), pygmy blue (*Balaenoptera musculus brevicauda*), Antarctic blue (Balaenoptera musculus), southern right (*Eubalaena australis*), common minke (*Balaenoptera acutorostrata*), Antarctic minke (*Balaenoptera bonaerensis*), fin (*Balaenoptera physalus*), Bryde's (*Balaenoptera brydei*), pygmy right (*Caperea marginata*), sperm (*Physeter macrocephalus*), pygmy sperm (*Kogia breviceps*) and pilot (*Globicephala*) species were identified as having interacted with vessels. The humpback whale exhibited the highest incidence of interaction followed by the southern right whale, and these species are known to be seasonally present in the waters of the operational areas on migration (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 49; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 363; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 393; Org ID: 593, ID: 2558, FB ID: 113).
- Dolphins including the Australian humpback (*Sousa sahulensis*), common bottlenose (*Tursiops truncatus*), Indo-pacific bottlenose (*Tursiops aduncus*) and Risso's dolphin (*Grampus griseus*) were also identified as interacting with vessels. The common bottlenose dolphin exhibited the highest incidence of interaction. A number of these species may reside in or pass through the waters of the operational areas (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 49; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 363; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 393; Org ID: 593, Event ID: 2558, FB ID: 113).
- There were no vessel interaction reports during the period for Australia sea-lions, Australian or New Zealand fur- seals. There have been incidents of seals being injured by boat propellers; However all indications are rather than 'boat strike' these can be attributed to the seal interacting/playing with a boat, with a number of experts indicating the incidence of boat strike for seals is very low.

Certain species are known to be more vulnerable than others. For example, southern right whales have been shown to be particularly vulnerable due to their colour, profile and lack of dorsal fin making them difficult to detect, and subsequently avoid. Previous studies have identified sperm whales to spend more time at the surface than other species, with individuals being observed sleeping at or just below the water surface (Miller et al. 2008). Juvenile and unwell individuals have also been identified to potentially spend more time at the surface (Koschinski 2003).

Individuals distracted by behavioural activities such as feeding, mating or nursing may be more vulnerable to vessel collision (Laist et al. 2001). A study by McKenna et al. (2015) showed that blue whales demonstrated limited behavioural response when being approached by ships. While some animals responded by undertaking shallow dives at a slow descent, none showed signs of horizontal movement away from the approaching ship.

The Australian and New Zealand fur-seals and the Australian sea-lion are highly agile species that haul themselves onto rocks and oil and gas platform structures. As such, it is considered likely that they will be able to avoid slow-moving vessels.

As stated previously, larger vessels travelling at faster speeds may cause fatal or severe injuries to cetaceans, with the most severe injuries caused by vessels travelling faster than 14 knots (Laist et al 2001). When vessels are stationary or slow moving, the risk of collision with cetaceans is extremely low, as the vessel's size and underwater noise 'footprint' will alert cetaceans to its presence and thus elicit avoidance.

Vessels operating within the operational areas will be travelling at no greater than 10 knots and no greater than 5 knots within the 2km radius drilling area and whilst undertaking a seabed survey, minimising the risk associated with fast moving vessels for this activity. However, there may be situations where a vessel is required to increase its speed within the operational areas, e.g. in the event of an emergency such as a person overboard.

In addition, all vessels will have a MMO who will be observing to detect whales and direct the vessel to maintain distance of 500 m from any whale.

The extent of the area of risk is predicted to be at the sea surface immediately adjacent to the MODU and vessels within the operational areas. The consequence of a collision causing injury / mortality to marine mammals has been assessed as **Minor (2),** based on:

- Minimising vessel collision is ranked as a high priority action within the Conservation Management Plans for blue whales and southern right whales, and within the Conservation Advice for fin and sei whales, and Conservation Listing for humpback whales.
- The foraging (annual high use) and distribution BIA for the pygmy blue whale intersects with the operational areas. The CMP for the Blue Whale (DoE 2015) details that vessel collisions will impede the recovery of blue whale populations if a sufficient number of individuals in the population lose reproductive fitness or are killed. Due to the short duration of exploration activities, slow speeds within operational and drilling areas and vessel/whale separation distances (CM02: Vessel and MODU Operating Procedures), a strike is considered unlikely and would not result in a sufficient number of individuals in the population losing reproductive fitness or being killed and thus would not impede the recovery of blue whales.
- During consultation, feedback was provided on importance of the Bass Strait as a migratory route for southern right whales (migration BIA), humpback whales and dwarf minke whales, and a foraging area (BIAs) for blue whales for additional consideration (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41-45):
    - The operational areas are within a migration BIA of the southern right whale (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467). Whilst under the Tasmanian *Threatened Species Protection Act 1995* the southern right whale is listed as Endangered, there is no state conservation management plan detailing threats to the species. The NRE Tasmania Conservation site (NRE Tasmania 2023) refers to the Commonwealth Conservation Management Plan for the Southern Right

Whale (DSEWPaC 2012b) which lists vessel collisions as a high-risk threat. The plan does not identify any actions relevant to the exploration activities but does note that reducing ship strike mortality can be most easily done either by reducing vessel speed or by separating vessels and whales. As both these will be implemented, with vessels being either stationary or operating at slow speeds (typically 5-10 knots) and the MODU typically stationary with an average speed of ~ 7 knots when in transit and vessels and the MODU when transiting maintaining a distance of 500 m from a whale (CM02: Vessel and MODU Operating Procedures), reducing the likelihood of a strike.

  - Whilst under the Tasmanian Threatened Species Protection Act 1995 the humpback is listed as Endangered, there is no state conservation management plan detailing threats to the species (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41-43, 45). The NRE Tasmania Conservation site (NRE Tasmania 2023) refers to the Commonwealth Conservation Advice for the Humpback Whale. Whilst Commonwealth listing advice for the humpback whale states the species is no longer listed as Vulnerable it still lists vessel strike from shipping activities as a threat but does not identify any actions. However, due to the short duration of exploration activities, slow speeds within operational areas, and vessel/whale separation distances (CM02: Vessel and MODU Operating Procedures), a strike is considered unlikely.
  - Dwarf minke whales are not listed as threatened species under the *Tasmanian Threatened Species Protection Act 1995 or the EPBC Act* and they are not considered to be in danger or at depleted levels (DCCEEW 2023) (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41-43, 45). Though there is no conservation advice for this species the DCCEEW SPRAT database identifies collision with large vessels as a threat (DoE 2023) but does not identify any actions. However, due to the short duration of exploration activities, slow speeds within operational areas, and vessel/whale separation distances (CM02: Vessel and MODU Operating Procedures), a strike is considered unlikely.
- The Recovery Plan for the Australian Sea-lion (*Neophoca cinerea*) (DSEWPaC 2013c) identifies the need to investigate and mitigate other potential threats including vessel strike, to ensure that anthropogenic activities do not hinder the recovery of the species.
- Vessel and MODU movements in the operational areas will be slow, and there are only up to three exploration vessels in the operational areas at any one time.
- The extent of the area of impact is predicted to be immediately adjacent to the MODU and vessels involved in the exploration program and is, therefore, a small potential area of impact.
- Given the expected low likelihood of vessel strike, exploration activities are not predicted to affect the long-term recovery of these species in accordance with relevant Conservation Plans and Advice.

The likelihood is assessed as **Remote**, given that movements within the operational areas are expected to be slow and limited. The inherent risk level is therefore **Low (RRI)**.

7.4.6.2. Conservation Values and Sensitivities

The T/49P operational area partially overlaps with the Zeehan AMP. If the final drilling locations are located within this conservation area, the potential impacts from an interaction with marine fauna could affect the values and sensitivities of this site, which include migrating humpback whales, blue whales, black-browed, wandering and shy albatross, and great-winged and cape petrels (DNP 2013). However, the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013) does not identify vessel and aircraft strikes as a pressure on the Zeehan AMP. Vessel activity has occurred historically across this area and the region, as demonstrated in the assessment of recent shipping traffic and historical fishing activity in the region, with no incidents of vessel strike recorded during previous exploration activities (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID:

395; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID:364) as expected given industry standard vessel speed restrictions and watchkeeping requirements.

The extent of the area of impact is predicted to be at the sea surface immediately adjacent to the MODU and vessels within the T/49P operational area. The consequence of a collision causing injury / mortality to the conservation value of the marine reserve has been assessed as **Minor (2),** based on:

- The South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) does not identify vessel or aircraft strikes as a pressure on the conservation values of the Zeehan AMP, which include migrating blue and humpback whales and seabirds (as assessed in birds and marine mammals above), and
- MODU and vessel movements in the operational areas will be slow, and there are only up to three exploration vessels in the operational areas at any one time, each with watchkeeping requirements in place.

The likelihood is assessed as **Remote**, given that movements within the operational areas are expected to be slow and limited. The overall risk rating is therefore **Low (RRI)**.

7.4.6.3. Cultural Environment

As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the operational areas overlap Sea Country for the duration of the activity.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by interactions with the MODU, vessels and aircraft.

Interaction with marine fauna is assessed as having a **Low (RRI)** risk level to the ecological receptors in offshore waters, with no long-term or population level impacts predicted. It is therefore predicted to pose a **Low (RRI)** risk level to associated cultural values within the operational areas.

7.4.7. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, Decision Context A has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure risks are managed to ALARP and acceptable levels.

Table 7-8 documents the assessment of control measures and ALARP demonstration for interactions with marine fauna.

Table 7-8: Control measures for Interactions with marine fauna and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
CM01: Marine Assurance Process	The MODU and vessels will meet the navigation equipment, watchkeeping, radar and lighting requirements of the Navigation Act 2012 and associated Marine Orders, e.g. MO 30 - Prevention of Collisions.
CM02: Vessel and MODU Operating Procedures	All vessels and aircraft will adhere to the distances and vessel management practices and reporting requirements of EPBC Regulations (Part 8 Division 8.1 interacting with cetaceans) and will implement an increased caution zone of 500 m between whales and vessels, to ensure cetaceans are not harmed during offshore activities. Reporting requirements for vessel strikes with cetaceans are included in the Implementation Strategy (Table 10-8), updated in response to consultation feedback (Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 366; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 397; Org ID: 7, Director of National Parks (DNP), Event ID: 2480).
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID:: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).
CM08: Fauna Management Plan	**Marine fauna observers** (Org ID: 597, Event ID: 1144, FB ID: 35) • A dedicated MFO with experience in whale observation, distance estimation and reporting, will undertake observations. • In addition, facility crew who act as Officer of the Watch will receive training from the MFO in whale observation and distance estimation to assist the MFO during daylight hours. • For activities greater than 5 consecutive days at sea with >12 hours daylight, an additional dedicated MFO trained in whale observation, distance estimation and reporting will support the experienced MFO. • As part of the activity induction all vessel and MODU crew will receive information on the EP controls and the importance of reporting whale sightings to the vessel MFO immediately.

Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Remove support vessels from activity	Eliminates potential for a vessel-fauna collision occurring.	Vessels are required to support operational activities and provide essential safety standby duties. Evaluation of trade-offs indicates Increased risks associated with the removal of support vessels are grossly disproportionate to benefit gained.	Reject.
Vessels to avoid dolphins, marine turtles, seals and flocks of rafting birds	Eliminates potential for vessel-fauna collision occurring.	Vessels are required to support operational activities and provide essential safety standby duties but can undertake to avoid other marine fauna where safe to implement. [Updated in response to Matter: M18].	Adopt: CM02: Vessel and MODU Operating Procedures CM08: Fauna Management Plan
Visual clearance of area from birds prior to initial flaring event at each well	Eliminates potential to impact birds during initial flaring event	The area extending from the tip of the flare can be visually confirmed to be clear of birds. This is practicable to implement for the initial flaring event at each well but thereafter flaring is determined by safety and testing requirements.	Adopt: CM10: Well Testing Program

Reduction			
Activities to only occur during daylight hours	Reduced potential for a vessel-fauna collision occurring as activities only undertaken during daylight hours when visibility highest.	The duration of the activity and associated costs would effectively double. Evaluation of trade-offs indicates increased impacts associated with emissions, discharges and underwater sound, and increased duration at sea may increase risk of vessel collision. Costs and trade-off impacts are considered grossly disproportionate to benefit gained.	Reject.
Activities to occur outside of sensitive periods only	Reduced risk of collisions (causing harm) during environmentally sensitive periods for listed marine fauna.	High cost in moving or delaying activity schedule. The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. There is no extended period of time when there are no species present in the Otway region as described in Section 6.6.7 (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 396; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 365). The implementation of additional controls, above the legislative requirements of the EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans, will manage potential impacts to whales undertaking biologically important behaviours.	Reject.
Further reduce vessel speeds	Reduced likelihood of interactions with marine fauna	Given the slow speeds at which vessels operate (~4-5 knots) within the drilling area and <10 knots within operational areas, and the controls currently in place (CM02 and CM08), the adoption of this control offers no further reduction in risk. Evaluation of trade-offs indicates increased duration of project activities, including affecting ability to compete MMO surveys, will also increase associated emissions, discharges and sound.	Reject
Delay take-off or landing to avoid birds	Eliminates potential to impact birds on take-off and landing	Pilots review proximity of birds to aircraft prior to take-off and on approach, and take action to ensure safe operations, including avoidance of bird strike where conditions and fuel permit. Consequently this control is already implemented.	Adopt: CM11: Procurement Vetting Process
Mitigation			
Design and implement a rescue program for grounded birds	A rescue program will not prevent birds grounding, but it has been proven useful to reducing mortality of seabirds, and therefore, provides an environmental benefit.	Administrative costs of incorporating this program into induction package and implementation throughout activity. Crew will be instructed to remain vigilant for seabird collisions with the	Adopt CM07: Light Management Plan

	Preparedness for handling will also reduce safety risks to personnel.	MODU and vessels (such as grounding on decks) and any observed/ discovered incidents will be recorded and reported within the environmental performance report. Good industry practice, environmental benefit outweighs additional cost.	

Receptor	Consequence	Likelihood	Residual Risk Rating
Ecological Receptors	Minor (2)	Remote (2)	Low (RR I)
Conservation Values and Sensitivities	Minor (2)	Remote (2)	Low (RR I)
Cultural Environment	Minor (2)	Remote (2)	Low (RR I)
ALARP Statement	The decision context has been assessed as Type A and the residual risk ratings are lower order – Low (RR I). The adopted control measures minimise the likelihood of interactions with marine fauna and are considered effective and appropriate to the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted risks to receptors from interactions with marine fauna associated with the Otway Exploration Drilling Program are reduced to ALARP.		

7.4.8. Acceptability Assessment

Table 7-3 compares the predicted risk ratings for loss of materials or waste overboard against the acceptable levels.

Table 7-3Table 7-9 compares the predicted risk levels for interaction with marine fauna against the acceptable levels.

Table 7-9: Comparison of defined acceptable levels with risk levels for interaction with marine fauna

Defined Acceptable Levels		Predicted Risk Level	Is predicted risk below defined acceptable level?
Source	Level		
Principles of ESD	Activities that result in temporary/ reversible, small scale, and/or low intensity environmental damage. Environmental risks have a worst-case ranking of less than Significant (RR III).	Planned activities are not expected to result in vessel or aircraft collision with marine fauna. The residual risk ranking is **Low (RR I)**.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Vessel collisions are listed as a threat in the: • Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012b) • Conservation Management Plan for the Blue Whale (DoE 2015) • Conservation advice for the sei whale (TSSC 2015c) • Conservation advice for the fin whale (TSSC 2015d)	Yes

Defined Acceptable Levels		Predicted Risk Level	Is predicted risk below defined acceptable level?
Source	Level		
		• Listing Advice for the humpback whale (TSSC 2022) • The Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) (DSEWPaC 2013c) • The Recovery Plan for Marine Turtles in Australia (CoA 2017) The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).	
Biological Ecological Economic Cultural	No death or injury to listed threatened or migratory species, from the activity.	Interactions with marine fauna are not planned to occur. There is a Low (RR I) residual risk because of the behaviour of marine fauna cannot be controlled. However, with the control measures adopted, the likelihood of a collision causing death or injury is considered remote.	Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted controls measures as listed above have been assessed to ensure that environmental risks will be of an acceptable level throughout the Otway Exploration Drilling Program.	Yes
ConocoPhillips Australia Policies	Environmental risks are consistent with environmental policies and processes such that residual environmental risks will be below Significant (RR III).	**Likelihood**: Remote **Consequence**: Minor (2) **Risk**: **Low (RR I)**	Yes
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to interactions with marine fauna have been considered (with more detail provided in Section 3). These include: • Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467 – Migration BIA for southern right whales • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 41-45 - Consideration of BIAs, important behaviours • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 397; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 366 – Reporting incidents • Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 396; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 365 – Avoiding sensitive periods • Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 395; Org ID: 111, Australian	Yes

Defined Acceptable Levels		Predicted Risk Level	Is predicted risk below defined acceptable level?
Source	**Level**		
		Marine Conservation Society, Event ID: 3785, FB ID:364 – Vessel strike in Zeehan MP • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 49; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 363; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 393; Org ID: 593, Event ID: 2558, FB ID: 113 – Data assessed	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type A risks are considered acceptable if the requirements in Table 7-9 can be demonstrated and if the level of residual risk has a rating less than Significant (RR III)). Further to this, following completion of the risk assessment process, the risk of interactions with marine fauna is considered acceptable because: • Vessel movements in the operational area will be slow (approximately 4-5 knots), and there are only up to three exploration vessels in the operational area at any one time. • MODU movements in the operational area will also be slow. • Vessel operations will be compliant with laws relating to cetaceans i.e. EPBC Regulations 2000. • Good practice control measures to minimise the risk of interaction with marine fauna are clearly defined and will be implemented. • The activity will be managed in accordance with relevant ConocoPhillips, Commonwealth, international, and Industry standards, guidelines, and requirements, and • No ecosystem integrity or population level impacts are expected if interactions do occur. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the risks of interactions with identified receptors. Based on the above evaluation, the risks associated with interactions with marine fauna meet the defined acceptable levels.		

7.4.9. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with interactions with marine fauna from the Otway Exploration Drilling Program are:

- EPO3: No death or injury to listed threatened or migratory species from the activity.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

7.5. Introduction, Establishment and Spread of Invasive Marine Species (IMS)

7.5.1. Hazard

The Department of Agriculture and Water Resources (DAWR 2018, now Department of Agriculture, Fisheries and Forestry (DAFF)) defines marine pests (referred to in this EP as IMS) as:

- Non-native marine plants or animals that harm Australia's marine environment, social amenity or industries that use the marine environment, or have the potential to do so if they were to be introduced, established (that is, forming self-sustaining populations) or spread in Australia's marine environment.

IMS can include fish, seastars, crabs, molluscs, worms, sponges, microscopic dinoflagellates, shellfish, algae, bacteria and viruses.

IMS are introduced to, and translocated within, Australian waters from ballast water discharges and biofouling on hulls and inside internal seawater pipes of vessels and facilities, as well as from marine debris and ocean currents.

During the Otway Exploration Drilling Program the introduction of IMS may result from:

- MODU operations, and
- Vessel operations.

7.5.2. Environmental Impacts

IMS introduction and establishment can result in a range of environmental impacts including:

- Changes in ecosystem dynamics, through:
  - Displacement, reduction, or fragmentation of the existing native population
  - Disruption of breeding cycles of local populations, impacting population viability
  - Alteration of habitat to an extent that causes long-term declines in local populations
  - Alteration of conservation values of protected areas.
- Changes to the functions, interests, or activities of other marine users, through:
  - Socio-economic impacts to marine industries (i.e. aquaculture and commercial fisheries).

7.5.3. Source of Risk

IMS could be transported to the operational areas via:

- Mobilisation of vessels and the MODU to the operational areas from previous contract(s) elsewhere within Australian Waters, and
- Transit of locally sourced vessels between Victorian and/or Tasmanian ports to the operational areas.

The following activities have the potential to result in the introduction of IMS within an operational area:

- Discharge of ballast water containing IMS, and
- Translocation of foreign species through biofouling on MODU and vessel hulls, niches (e.g., thruster tunnels, sea chests), in-water equipment (e.g. anchor spread, ROV) plus disposal of contaminated waste and materials containing IMS.

If IMS is introduced to an operational area by one of these pathways, it is also possible that support vessel conveyances could act as a vector for IMS spread from an operational area into coastal areas / port environments.

7.5.3.1. Ballast Water

DAWR estimates that ballast water is responsible for 30% of all marine pest incursions into Australian waters (DAWR 2018) and declares that all saltwater from ports or coastal waters outside Australia's territorial seas presents a high risk of introducing foreign marine pests into Australia (DAWE 2020b). DAWR (2018) notes that the movement of vessels and marine infrastructure is the primary pathway for the introduction of IMS.

The MODU and vessels (both hereafter referred to as vessels) may ballast and de-ballast to improve stability, even out vessel stresses and adjust vessel draft, list and trim, regarding the weight of equipment on board at any time. During the uptake of ballast water from the surrounding environment, it is possible for a vessel to take in water that contains planktonic biota, including holoplankton, gametes, spores and larvae. This biota may then be discharged at the vessel's new location during ballast water exchange. The risk of species introduction is greatest when coastal water is taken up in one location and discharged at another with similar physical and environmental characteristics (MIAL 2020).

DAFF administers the Australian Ballast Water Management Requirements (ABWMR) (DAWE 2020b, Version 8), which provide for Australia's commitment to the International Convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Convention) (IMO 2017). DAFF is the lead agency for the management of ballast water and sediments on international vessels under the Commonwealth Biosecurity Act 2015. All international vessels are required to manage ballast water in accordance with the ABWMR and the Biosecurity (Ballast Water and Sediment) Determination 2017. Australian legislation also extends application of the requirements of the International Convention to domestic vessel activities – which includes a requirement for vessels servicing the offshore resources sector to manage ballast water. In addition to vessels entering Australian waters declaring information regarding the management of ballast water to biosecurity officers using MARS, they are also required to:

- Manage ballast water between Australian ports
- Carry a Ballast Water Management Plan and Ballast Water Management Certificate and maintain ballast water records, and
- Have installed and use an International Maritime Organisation (IMO)-approved ballast water management system to meet new ballast water discharge standards.

These arrangements prohibit the discharge of high-risk ballast water within Australian territorial seas (within 12 NM of Australian territories) including Australian ports.

During the Otway Exploration Drilling Program, vessels may be required to undertake ballast water exchange on route to and within an operational area. The selected MODU is expected to be arriving to the Otway region from the North West Shelf and vessels are expected to be from within Australian waters.

7.5.3.2. Biofouling

Biofouling is the accumulation of aquatic microorganisms, algae, plants and animals on vessel hulls and submerged surfaces. More than 250 non-indigenous marine species have established in Australian waters, with research indicating that biofouling has been responsible for more foreign marine introductions than ballast water (DAWE 2020b).

The time a vessel spends in a location (residence time) has an influence on the likelihood of species attachment or uptake at a source. The longer a vessel sits in any one location, the more likely it is to be colonised by biofouling species. The length of time a vessel spends stationary can also impact on the performance of some types of antifouling coatings (MIAL 2020).

Biofouling is managed under the Commonwealth Biosecurity Act 2015, via the National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (NBMG) (DAFF 2009). These guidelines align with the internationally agreed 2011 Guidelines for the Control and Management of Ships Biofouling to Minimise the Transfer of Invasive Aquatic Species (the IMO Biofouling Guidelines; IMO 2011).

IMS are thought to be one of the most serious anthropogenic threats to global marine biodiversity (Wells 2018). However, successful IMS colonisation requires three stages (Marine Pest Sectoral Committee 2018):

- Colonisation and establishment of the marine pest on a vector (vessel, equipment or structure) in a donor region (a home port, harbour or coastal project site where a marine pest is established)
- Survival of the settled marine pests on the vector during the voyage from the donor to the recipient region, and
- Colonisation (for example, by reproduction or dislodgement) of the recipient region by the marine pest, followed by successful establishment of a viable new local population.

The risk of an IMS being able to successfully establish itself will depend on depth, distance from the coast, water movement and latitude. The probability of successful IMS settlement and recruitment will decrease in well-mixed, deep ocean waters away from coastal habitats. IMS travelling through several latitudes will also have to survive significant temperature and salinity changes. The Australian Government Bureau of Resource Sciences (BRS) established that the relative risk of an IMS incursion around the Australian coastline decreases with distance from the shoreline, and modelling conducted by BRS (2007) estimates:

- 33% chance of colonisation at 3 nm (5.56 km)
- 8% chance at 12 nm (22.22 km), and
- 2% chance at 24 nm (44.45 km).

In comparison, the closest points on the operational areas are approximately 19 km from the Victorian Coast and approximately 28 km from King Island.

Within Australia, over 250 exotic marine species have been introduced with most having little impact, but some species have become aggressive pests in certain locations (DoAFF 2021). The typical habitat of the nine species currently listed on the Marine Pest website (DoAFF 2023) is shallow marine waters. See Section 4.6.11 for details.

7.5.3.3. Additional Commonwealth Requirements

DAFF ensure international vessels arriving in Australian territory comply with International Health Regulations and manage biosecurity risks through pre-arrival reporting, assessment and inspection. For the entire time an international vessel is in Australian waters, it must accurately report information in accordance with Section 193 of the Biosecurity Act 2015 to DAFF, including information on ballast water and biofouling. For commercial vessel, reporting obligations are met once vessel pre-arrival information has been submitted in the Maritime Arrivals Reporting system (MARS). Pre-arrival reporting in MARS ensures that the biosecurity risk of each vessel entering Australian waters is assessed and managed. Where vessel reporting does not meet DAFFs standards additional directions or corrective actions will be issued by a biosecurity officer.

Under the Biosecurity Act 2015, all international vessels become subject to biosecurity control on entering Australian territorial seas. Vessels subject to biosecurity control must only enter Australia at ports that have been determined as first points of entry under section 229 of the Biosecurity Act 2015. ConocoPhillips Australia have confirmed that prior to mobilising to the Otway region, the selected MODU and support vessels will have:

- Undertaken mandatory pre-arrival reporting using DAFFs Maritime Arrivals Reporting System (MARS)
- Received advice on biosecurity, pratique and berthing conditions from DAFF, and
- Entered Australia at a designated first point of entry.

In addition to DAFFs requirements, Australian state and territory governments also have biosecurity requirements.

The ConocoPhillips Global Marine Risk Management Standard (GM-STD-MA-003) outlines the approvals, audits and standards required for all MODUs, vessels and associated equipment used in the throughout the Otway Exploration Drilling Program (see Section 10.3.3 for further details).

7.5.4. Defining the Environment that May Be Affected (EMBA)

Table 7-10 describes how the EMBA has been defined for the receptors and impacts that have been identified to be potentially impacted by the introduction of an IMS.

Table 7-10: EMBA for the introduction and establishment of IMS

Aspect	EMBA	Basis of EMBA	Source	Spatial extent
Introduction of IMS	Operational area (2 km around target location)	The risk of the introduction of IMS to the area is posed by the physical presence of the MODU, vessels and submerged equipment.	*Commonwealth Biosecurity Act 2015.*	Operational areas The extent of the introduction of IMS is localised. If IMS are able to successfully establish, and then spread, the extent may become more widespread.

7.5.5. Identifying Sensitive Receptors

The introduction and establishment of IMS can cause significant impacts on economic, ecological, social, and cultural values of the marine environment, including the introduction of new diseases, altering ecosystem processes and reducing biodiversity, causing major economic loss and disrupting human activities (Brusati and Grosholz 2007).

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of risks associated with the introduction, establishment and spread of IMS, as per the EPBC Act and the Environment Regulations, to be:

- Values and sensitivities as part of the Commonwealth marine environment
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

The introduction of IMS can change ecosystem dynamics, potentially impacting:

- Marine Invertebrates
- Benthic habitats, and
- Conservation values and sensitivities.

It can also result in changes to the functions, interests or activities of other users, potentially impacting:

- Commercial fisheries.

The EPBC PMST report for the operational areas did not identify any threatened marine invertebrate species, benthic habitats or key ecological features (KEFs) with unique seabed characteristics. However, it is noted that the West Tasmania Canyon KEF and the Bonney Coast Upwelling KEF are situated approximately 1.8 km and 3 km outside of the T/49P and VIC/P79 operational areas respectively. Further, the EPBC PMST report identified that the operational area overlaps the Zeehan Commonwealth Marine Park (Multiple Use Zone VI)

The operational areas overlap areas with historic fishing effort for Victorian and Tasmanian giant crab and southern rock lobster.

7.5.6. Evaluation of Environmental Risks

Successful translocation and establishment of IMS into a new environment depends on several factors. Water currents, upwellings, habitat type, water depth, wave exposure, water temperature, salinity and the distance from the coast are all natural dispersion barriers which have been shown to limit the successful establishment and reproduction of IMS populations (Forrest et al. 2009). It is estimated that only one in six introduced marine species establish themselves and become a pest (DoE 2015b).

In general, deep, well-mixed ocean waters away from coastal habitats have been shown to have a lower risk of IMS establishing. Highly disturbed environments (such as marinas) and the presence of rocky, hard substrates or subsea infrastructure, especially with pre-existing biofouling, has been associated with a higher risk of successful IMS establishment.

The majority of marine pests identified to occur in ports relevant to the Otway Exploration Drilling Program prefer hard substrates or soft sediments within shallow coastal waters (see Section 4.6.11, Table 4), such as the Asian date mussel (*Musculista senhousia*), European fan worms (*Sabella spallanzannii*), European shoe crab (*Carcinus maenas*), Japanese kelp (*Undaria pinnatifida*), Northern Pacific seastar (*Asterias amurensis*), Aquarium Caulerpa (*Caulerpa taxifolia*), and the Asian shore crab (*Hemigrapsus sanguineus*). Only a few of the relevant pest species are known to inhabit deeper waters, such as the New Zealand screw shell (*Maoricolpus roseus*) found on the sea floor at depths of 130 m, and occasionally the Northern Pacific seastar (*Asterias amurensis*) which can be up in waters up to 200 m deep.

DAFF notes that the movement of vessels and marine infrastructure is the primary pathway for the introduction of IMS, with estimates that ballast water is responsible for 30% of all marine pest incursions into Australian waters (DAWR 2018). DAFF ensures international vessels arriving in Australian territory comply with International Health Regulations and manage biosecurity risks through pre-arrival reporting, assessment, and inspection. Furthermore, DAFF (and predecessors) introduced regulations making it mandatory for vessels to exchange ballast water outside territorial sea. These regulations have greatly reduced the risk of IMS introduction from international shipping.

In the event that IMS are successfully introduced into an environment the level of damage is varied. Due to the complexity of ecosystems and the associated interactions between and amongst biotic and abiotic receptors, it can be difficult to predict the effects.

The introduction of IMS for the Otway Exploration Drilling Program could affect marine invertebrates and the associated benthic habitats within the operational areas, protected marine areas present within the wider region, and commercial fisheries. However, vessel management systems addressing IMS are well practiced and well understood. The likelihood of an introduction of IMS is assessed as **Remote (2)**, with the subsequent establishment and spread of IMS assessed as **Improbable (1)**, given that IMS would be unable to colonise benthic substrate due to the deep and well mixed waters within the operational areas.

7.5.6.1. Ecological Receptors

Benthic Habitats and Communities and Conservation Values and Sensitivity

The successful establishment of IMS could reduce, fragment or displace native marine invertebrates and benthic assemblages, and disrupt the breeding cycle of local benthic populations, impacting the population viability, causing long-term declines to native populations. However, given the operational areas do not present benthic habitats or structures that are favourable to IMS survival, the extent of risk to marine invertebrates is predicted to be restricted to small, isolated locations with limited opportunity to spread or become established.

The conservation value of marine protected areas can be compromised by foreign species modifying the habitat and driving out native species. A reduction in the abundance and diversity of native species could result in a reduction of conservation values and compromise the value of the conservation management program in place (Bax et al. 2003; Relini et al. 2020).

The operational areas partially overlap the Zeehan AMP (Multiple Use Zone, IUCN VI). If final drilling locations are located within this conservation area, the potential impacts to the ecological environment associated with IMS could affect the values and sensitivities of this site.

The Zeehan AMP includes a variety of seabed habitats, including exposed limestone, that support rich animal communities of large sponges and lace coral and other, permanently fixed, invertebrates on the continental shelf (DNP 2013). The rocky limestone provides important habitats for a variety of commercial fish species, such as the Australia's giant crab (*Pseudocarcinus gigas*), and a nursery ground for blue warehou (*Seriolella brama*) and ocean perch (*Sebastes alutus*) (DNP 2013). However, a recent study commissioned by the University of Tasmania for Parks Australia found that the fractured limestone reef pavement in the Zeehan Marine Park was rarely undercut and therefore unsuitable for crevice-dwelling species such as the SRL (Barrett et al. 2023).. Water depths of the Zeehan AMP that overlap the T/49P operational area range from 100 m to 110 m. As the majority of pest species listed on the DoA (2021) website inhabit shallow waters and coastal habitats it is considered highly unlikely that IMS would be able to colonise benthic habitat within the depths of the operational area that insect the Zeehan AMP.

The extent of the area of risk is predicted to be on the seabed and within the water column within the operational areas. The consequence of IMS introduction has been assessed as **Minor (2)**, with the consequence of IMS establishment and spread assessed as **Major (4)** where a change in ecosystem dynamics affects benthic assemblages or protected areas, based on:

- IMS introduced to the marine environment could cause a change in ecosystem dynamics by the altering ecosystem processes, reducing biodiversity and native species abundance, introducing new diseases, and dominating habitats if they became established and spread.
- The South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (Director of National Parks 2013) identifies IMS and diseases translocated by shipping, fishing vessels and other vessels as a threat to the AMP network.
- The implementation of the controls makes it unlikely that IMS will be introduced from the activity and spread to nearby KEFs and AMPs.
- There are no EPBC plans (management plans, recovery plans or conservation advice) which relate specifically to IMS introduction and establishment as a threat to marine invertebrates.
- The operational areas are unlikely to host IMS given water depths are predominantly ~100 m and range from 53 to 500 m.
- There are no protected benthic assemblage species within the Zeehan AMP or West Tasmania KEF that are listed within the EPBC PMST and given the depths of the benthic values within the Zeehan AMP and West Tasmania KEF, the likelihood of an IMS becoming established and spreading is improbable.
- Vessels operating within the operational areas will all be subject to Australian legislation including ballast water management and the Commonwealth Biosecurity Act 2015 and additional control measures as detailed in Table 7-11.
- High energy oceanographic processes within the operational area will result in rapid dispersion of IMS larvae or algal spores limiting successful reproduction and establishment of invasive populations.

The likelihood of IMS being introduced within the operational areas is **Remote (2)**, resulting in an inherent risk rating of **Low (RR I)**. The likelihood of IMS becoming established within the operational areas and spreading to proximal areas of conservation value is **Improbable (1)**, resulting in an inherent risk rating of **Low (RR I)**.

7.5.6.2. Socio-Economic Receptors

Commercial Fisheries

The introduction and successful establishment of IMS has the potential to result in changes to the functions, interests, or activities to commercial fisheries by depleting fishing grounds and aquaculture stock. Commercial species have been shown to be economically impacted by the introduction and establishment of invasive species (Bax et al. 2003). The economic damage also includes the additional management costs, as IMS are particularly difficult to eradicate from areas once established (Hewitt, et al. 2002). For example, the introduction of the Northern Pacific seastar (*Asterias amurensis*) has been linked to a decline in scallop fisheries in Victorian and Tasmanian waters (DSE 2004, Dommisse and Hough 2004).

Two commercially fished marine invertebrate species are present within the operational areas which could be susceptible to IMS (see Section 4.7):

- The giant crab (*Pseudocarcinus gigas*), and
- Southern rock lobster (SRL) (*Jasus edwardsii*).

Whilst the giant crab fishery in Tasmania is classified as a depleted stock, current pressures do not include invasive species (FRDC 2020a). The Victorian Giant Crab fishery and the SRL fisheries are a sustainable stock with the FRDC not reporting current impacts by IMS species (FRDC 2020a; FRDC 2020). Research has shown that both crab and lobster species can be susceptible to paralytic shellfish toxins and bacteria, resulting in a reduction in the value of the afflicted lobsters, however none have been shown to be related to the introduction of IMS (Musgrove et al. 2010). Furthermore, none of the fisheries within the operational areas currently list IMS as a threat.

The extent of the initial risk to commercial fisheries is likely to be localised (isolated locations if there is no spread); but may become more widespread if colonisation and spread occurs.

The extent of the area of risk includes commercial fisheries overlapping the operational areas. The consequence of IMS introduction has been assessed as **Minor (2)**, with the consequence of IMS establishment and spread assessed as **Major (4)** where it results in changes to the functions, interests or activities of commercial fisheries, based on:

- The establishment of IMS may cause a change in the functions, interests, or activities of commercial fisheries, resulting in socio-economic impacts.
- There are no EPBC plans (management plans, recovery plans or conservation advice) which relate specifically to IMS introduction and establishment as a threat to commercial fisheries species.
- High energy oceanographic processes within the operational areas will result in rapid dispersion of potential IMS larvae or algal spores limiting successful reproduction and establishment of invasive populations.
- The operational areas are unlikely to host IMS given water depths are predominantly ~100 m and range from 53 to 500 m, and
- Vessels operating within the operational areas will all be subject to Australian legislation including ballast water management and the Commonwealth Biosecurity Act 2015.

The likelihood of IMS being introduced within the operational areas is **Remote (2)**, resulting in an inherent risk rating of **Low (RR I)**. The likelihood of IMS becoming established within the operational areas or spreading to proximal areas of conservation value is **Improbable (1)**, resulting in an inherent risk rating of **Low (RR I)**.

7.5.6.3. Cultural Environment

As described in Section 4.8.2, Sea Country connection extends far beyond the current shoreline. Therefore, the operational areas overlap Sea Country for the duration of the activity.

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). The implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by invasive marine species.

The consequence of IMS establishment and spread assessed as **Major (4)** where it results in changes to the functions, interests or activities of First Nations Peoples. The likelihood of IMS becoming established within the operational areas, spreading to proximal areas of conservation value, and affecting associated cultural values is **Improbable (1)**, resulting in an inherent risk rating of **Low (RR I)**. [Paragraph updated in response to Matter: FN17].

7.5.7. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context A** has been applied:

- Impacts are well understood
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Good practice control measures are sufficient to ensure lower-order risks are managed to ALARP and acceptable levels.

Table 7-11 documents the assessment of control measures, ALARP and Acceptability relevant to the introduction and establishment of IMS.

Table 7-11: Introduction, establishment and spread of IMS control measures and demonstration of ALARP

Adopted Control Measures	
Control	**Source of good practice control measure**
CM01: Marine Assurance Process	The marine assurance system is administered by ConocoPhillips Australia and, amongst other requirements, ensures compliance of contract vessels with MARPOL, COLREGS, and Marine Orders. ConocoPhillips Australia undertakes vessel contractor vetting in accordance with its Marine Risk Management Standard (GMSTD- MA-003) and ensures adherence to the Australian Ballast Water Management Requirements (Version 8) and biofouling controls to meet EP requirements. This includes: Vessels will manage ballast water exchange/discharge using one of the following approved methods of management:

	- An approved ballast water management system - Ballast water exchange conducted in an acceptable area (as defined in the Ballast Water Management Requirements (Version8) - Use of low-risk ballast water (such as fresh potable water, high seas water or fresh water from an on-board fresh water production facility) - Retention of high-risk ballast water on board the vessel, or - Discharge to an approved ballast water reception facility. Vessels will have a Ballast Water Management Plan in place and valid Ballast Water Management Certificate (unless an exemption applies or is obtained from (DCCEEW). Vessels will maintain a complete and accurate Ballast Water Record System that is consistent with the Ballast Water Management Requirements (Version 8). Vessels will hold a valid Ship Sanitation Control Certificate or Ship Sanitation Control Exemption Certificate. Vessels will demonstrate proactive management of biofouling prior to entering Australian territorial waters, e.g. by implementing effective biofouling management plan. Effective anti-fouling systems and management practices are adopted that comply with the requirements of Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships and the requirements of the Protection of the Sea (Harmful Antifouling Systems) Act 2006. The system also requires the contractor to have an HSE management plan and to provide a bridging document that needs to be approved by ConocoPhillips Australia prior to execution. This process requires an IMS risk assessment be conducted on vessels by a qualified IMS inspector, prior to mobilisation into the region. Vessels and the MODU must be assessed as 'low risk' prior to mobilisation. This procedure assures ConocoPhillips Australia's adherence to the International Convention for the Control and Management of Ship's Ballast Water and Sediments 2004 and the Australian Ballast Water Management Requirements (DAWE 2020b).		
CM02: Vessel and MODU Operating Procedures	In accordance with the Ballast Water Management Requirements (Version 8), vessels will not exchange ballast water within 12 NM from the nearest land and in water depths of less than 50 m unless sourced from Australian waters.		
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88.		
Additional Controls Assessed			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Mandatory dry docking of vessels prior to entering operational areas to clean and remove biofouling.	Ensures no IMS are present on vessels or associated equipment.	Substantial costs associated with dry docking and schedule impacts are considered grossly disproportionate to the risk, particularly considering the other controls in place are expected to effectively reduce the risks associated with IMS.	Reject
Heat or chemical treatment of ballast water to eliminate IMS.	Eliminates potential for IMS to be introduced via ballast water.	Evaluation of trade-offs indicates environmental impacts associated with introduction of chemicals/hot water to marine environment would likely be toxic or result in death of native marine species. High cost and trade-off impacts are grossly disproportionate to benefit gained.	Reject

Filter seawater or use potable water for ballast.	Depending on filter size, may eliminate or at least reduce introduction of potential IMS.	Evaluation of trade-offs associated with producing freshwater and/or filtering seawater identifies additional chemical and energy use, and reduced ability to meet volumes and timeframes for safe ballasting. Costs and trade-offs are considered disproportionate to the benefit gained.	Reject
Utilise alternative ballast system to avoid uptake and discharge of water.	Eliminates need for ballast water exchange, therefore decreasing risk of introducing IMS through ballast water.	MODU/vessels suitable for the activity rely on ballast water for safe operations. Would require significant modification of vessels, or use of alternative MODU, like jack-up with associated HSE trade-offs (i.e. unsuited to water depths). High cost and trade-off impacts are grossly disproportionate to benefit gained.	Reject
Zero discharge of ballast water.	Reduces the likelihood of IMS introduction from ballast water exchange.	Ballast water exchange is required on the MODU and vessels for stability and safe operations. HSE trade-off impacts are grossly disproportionate to benefit gained.	Reject
Reduction			
Contract MODU/ vessels only operating in State or Commonwealth waters.	Reduces likelihood that IMS from other regions are present on vessel or associated equipment.	MODU/vessels and equipment suitable for the activity may not be available in State/ Commonwealth waters. Significant costs and delay in schedule considered grossly disproportionate to benefit gained.	Reject
Confirm clearance advice on biosecurity, pratique and berthing conditions from DAFF.	Confirms that the vessel(s) do not present a high risk to the marine environment in Australian waters and therefore reduces the likelihood of IMS being introduced. Clearance	Standard practice to confirm how the requirements of DAFF, for entry into Australian waters, have been met and how biofouling has been managed prior to arriving in Australian territorial seas.	Adopt CM01: Marine Assurance Process
Mitigation			
Report sightings of potential IMS to commonwealth and State Agencies	Supports proactive mitigation of potential introductions and/or avoidance of areas of suspected IMS, reducing the risk of spread and establishment.	Good practice, environmental benefit outweighs additional cost. Included in Implementation Strategy and Consultation and communication Plan.	Adopt CM03: Marine and Coastal Users Consultation and Communication Plan

Receptor	Aspect	Consequence	Likelihood	Residual Risk Rating
Ecological Receptors	Introduction	Minor (4)	Remote (2)	Low (RR I)
	Establishment and Spread	Major (4)	Improbable (1)	Low (RR I)
Socio-Economic Receptors	Introduction	Minor (2)	Remote (2)	Low (RR I)
	Establishment and Spread	Major (4)	Improbable (1)	Low (RR I)
Cultural Environment	Establishment and Spread	Major (4)	Improbable (1)	Low (RR I)

ALARP Statement	The decision context has been assessed as Type A and the residual risk ratings are lower order – Low (RR I). The adopted control measures minimise the likelihood of introduction, establishment and spread of IMS and are considered effective and appropriate to the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were reasonably practicable to implement. Therefore, the predicted

	risks to the environment from the introduction, establishment and spread of IMS associated with the Otway Exploration Drilling Program are reduced to ALARP.

7.5.8. Acceptability Assessment

Table 7-12 compares the impact levels of introduction, establishment and spread of IMS against the defined acceptable levels.

Table 7-12: Comparison of defined acceptable levels with risk levels for the introduction of IMS

Defined Acceptable Levels				
Source	**Level**	**Predicted Risk Level**		**Is predicted risk below defined acceptable level?**
Principles of ESD	Activities that result in temporary/ reversible, small scale, and/or low intensity environmental damage. Environmental risks have a worst-case risk ranking less than Significant (RR III).	The introduction and establishment of IMS could have major consequences for the local environment. However, planned activities are not expected to result in the introduction of IMS as standard operating procedures are well understood and adhered to by the shipping and oil and gas industry resulting in a risk rating of **Low (RR I)**.		Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.		Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).		Yes
Biological Ecological Economic Cultural	No invasive marine species introduced, established or spread attributable to the activity.	Vessels associated equipment will have a low risk of invasive marine species prior to deployment to the operational areas.		Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted controls measures as listed above have been assessed to ensure that environmental risks will be of an acceptable level throughout the Exploration Program.		Yes
ConocoPhillips Australia Policies	Environmental risks are consistent with environmental policies and processes such that residual environmental risks will be below Significant (RR III).	**Likelihood**	Improbable (1)	Yes
		Consequence	Major (4)	
		Risk	**Low (RR I)**	
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of	Claims and objections relevant to IMS have been considered (with more detail provided in Section 3). These include: • Org ID: 14, Department of Natural Resources and Environment		Yes

Defined Acceptable Levels			
Source	**Level**	**Predicted Risk Level**	**Is predicted risk below defined acceptable level?**
	the EP. The views of public will be considered in the preparation of the EP following public comment.	Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type A risks are considered acceptable if the requirements in Table 7-12 can be demonstrated and if the level of residual risk has a rating less than Significant (RR III)). Further to this, following completion of the risk assessment process, the environmental risks arising from the introduction, establishment and spread of IMS are considered acceptable because: • The impacts and vectors associated with IMS introduction are well known • Contractor IMS risk assessment process and vetting will be undertaken • The MODU and Vessels will be assessed by a qualified IMS inspector as having a low risk of invasive marine species prior to deployment to the operational area • Good practice control measures to minimise the risk of IMS are clearly defined and will be implemented, and • The activity will be managed in accordance with relevant ConocoPhillips, Commonwealth, international, and Industry standards, guidelines, and requirements. • No ecosystem integrity impacts are expected if an introduction does occur given water depths. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the risks of IMS. Based on the above evaluation, the risks associated with IMS meet the defined acceptable levels.		

7.5.9. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with the introduction, establishment and spread of IMS from the Otway Exploration Drilling Program are:

- EPO11: No invasive marine species introduced, established or spread attributable to the activity.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

7.6. Marine Diesel Oil Release

7.6.1. Hazards

Offshore vessels and equipment onboard vessels and the MODU are powered by marine fuel oil, which is created using a blend of distillates. The offshore vessels used during the Otway Exploration Drilling Program will either use Marine Diesel Oil (MDO) or Marine Gas Oil (MGO) as fuel. MDO is a more persistent fuel blend, and therefore represents the worst-case scenario.

During the Otway Exploration Drilling Program, the accidental loss of containment of MDO may result from a vessel-to-vessel collision, vessel-to-MODU collision, or during refuelling.

A vessel collision typically occurs as a result of:

- Mechanical failure/loss of Dynamic Positioning (DP) system
- Navigational error, and
- Foundering due to weather.

Refuelling incidents typically occurs as a result of:

- Failure of fittings, couplings or bulk transfer hose during refuelling, and
- Tank overfill during refuelling.

Vessel grounding is not considered credible due to the water depths in the operational areas (ranging from 53 m to 500 m) and absence of submerged features.

A vessel collision within the operational area has been identified as the worst-case credible spill scenario based on the AMSA Technical guidelines for preparing contingency plans for marine and coastal facilities (AMSA 2015), and the calculation of discharge volume and timing aligns with the methodology recommended therein.

7.6.2. Spill Modelling

As the risk of an MDO spill cannot be eliminated, detailed response plans are required to be developed to demonstrate preparedness in the extremely unlikely event a spill occurs (see Appendix EI). Oil spill modelling is conducted to support the development of these response plans. Modelled simulations provide an informed estimate of where the oil might go if nothing is done to respond and allows the prediction of possible effects. However, as metocean conditions like currents, wind, waves and temperature are always changing, stochastic modelling is undertaken whereby 100s of hypothetical spills are simulated under different conditions to show where oil from a spill could go.

ConocoPhillips Australia commissioned RPS Group (RPS 2023) to conduct stochastic modelling and deterministic analysis (Appendix E E) to predict the potential impacts from a 350 m^3 surface release of MDO over 6 hours. This scenario represents a loss of inventory from the largest fuel tank on a typical supply vessel due to a hypothetical vessel collision incident. RPS conducted modelling for activities across three broad areas during the exploration program, being the northern extent of VIC/P79, the southern extent of VIC/P79 and across T/49P (Appendix E). The locations were selected to be representative of all potential activity locations within the operational areas based on water depth, proximity to the coast and continental slope (Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 370).

Stochastic modelling is created by overlaying hundreds of individual computer-simulated hypothetical spills and provides a basis for response planning by defining the area within which the probabilities of exposure to hydrocarbons are calculated for environmental values and sensitivities, and protection priorities are established.

Analysis of the simulations developed during stochastic modelling is conducted to identify hypothetical simulations that predict possible worst-case outcomes, typically based on the maximum volume of oil (hydrocarbon) ashore, the largest swept area (area of floating hydrocarbon), minimum time to shoreline and longest length of shoreline contacted by hydrocarbons. Deterministic analysis is used for preparedness and response planning to establish the type and amount of resources (e.g., equipment) needed to be available for immediate deployment.

In the highly unlikely event of a spill, the response will include integration with local, national and international response organisation to mobilise resources including experts and specialist equipment. Details on resourcing and response arrangements for an MDO spill are included in the Oil Pollution Emergency Plan (OPEP) in Appendix I.

7.6.2.1. Stochastic Modelling

Stochastic (or multiple spill simulation) modelling was performed at multiple locations across the operational areas to represent the range of possible drilling locations (Figures 7-1, 7-2 and 7-3) and accounted for differing seasonal conditions – summer (October to March) and winter (April to September) – defined by the unique prevailing wind and general current conditions of each.

The modelling study was carried out in stages:

1) A ten-year current dataset (2010–2019) was developed that included the combined influence of ocean currents from the HYCOM model and tidal currents from the HYDROMAP model
2) High-resolution local winds from the Climate Forecast System Reanalysis model and detailed hydrocarbon characteristics were collated, and
3) The above datasets were input into the three-dimensional trajectory and fate oil spill model, Spill Impact Mapping Analysis Program (SIMAP), which simulates the transport, spreading, entrainment and evaporation of spilled hydrocarbons over time based on the prevailing wind and current conditions and the physical and chemical properties of the oil.

The SIMAP model was then run using a stochastic (random or non-deterministic) approach, which involved running 100 spill simulations per season at each location (200 simulations in total per location), initiated at random start times using the same release information (spill volume, duration and composition of the oil). This ensured that each simulation was subject to different wind and current conditions and, in turn, movement and weathering of the oil as spills can occur during any set of wind and current conditions.

Details of modelling scenarios are provided in the modelling report (RPS 2023) (Appendix E).

7.6.2.2. Characteristics of MDO

MDO is generally considered to be a low viscosity and non-persistent oil that readily degrades by naturally occurring microbes. It is considered to have a higher aquatic toxicity and high potential to bioaccumulate in organisms, compared to many other crude oils due to the types of hydrocarbons present and bioavailability.

MDO is a medium-grade oil (classified as a Group II oil) commonly used in the maritime industry. It has a low density and a low dynamic viscosity (Table 7-13), indicating that this oil will spread quickly when spilled at sea and thin out to low thicknesses, increasing the rate of evaporation. Table 7-14 shows the boiling point ranges for the diesel used in the spill modelling.

Due to its chemical composition, approximately 40% will generally evaporate within the first day, with the remaining volatiles evaporating over 3-4 days depending upon the prevailing conditions. Diesel shows a strong tendency to entrain into the upper water column in the presence of moderate winds and breaking waves (>12 knots) but floats to the surface when conditions are calm, which delays the evaporation process.

On release to the marine environment, MDO would evaporate and decay and be distributed over time into various components. The components with the most potential to impact the marine environment include surface hydrocarbons, entrained hydrocarbons (non-dissolved oil droplets that are physically entrained into the water column by wave action) and dissolved hydrocarbons (principally the aromatics). These are discussed in further detail below.

Table 7-13: Physical characteristics of MDO

Parameter	Characteristics
Density (kg/m^3)	829 at 15°C
API	37.6
Dynamic viscosity (cP)	4.0 at 25°C
Oil category	Group II
Oil persistence classification	Light-persistent oil

Table 7-14: Boiling point ranges of MDO

Characteristic	Non-Persistent			Persistent
	Volatiles (%)	Semi-volatiles (%)	Low volatiles (%)	Residual (%)
Boiling point (°C)	<180	180 – 265	265 – 380	>380
Marine Diesel Oil	6.0	34.6	54.4	5

7.6.2.3. Hydrocarbon Exposure Values

Once all 100 hypothetical simulations are completed for a given location the results are combined to determine seasonal exposures to surrounding waters, shorelines and sensitive receptors. The exposure values applied in modelling, presented in Table 7-15, are intended to approximate the spatial extent and variability of the receiving environment's contact with oil, taking into consideration the values and sensitivities of the environment as outlined in the NOPSEMA Oil Spill Modelling Bulletin (NOPSEMA 2019). These exposure values (or thresholds) are used to inform:

- The spatial extent of the environment that may be affected by differing hydrocarbon exposures, including identification of receptors (e.g. ecological, social, economic and cultural features) that may be exposed to oil under varying conditions and species and/or their habitats with statutory management arrangements, using low thresholds to set the outer bounds of the environment that may be affected (EMBA).
- The evaluation of the full range of spill consequences from lower order water quality and aesthetic consequences, through to physical and toxicological consequences, and
- A basis for oil spill response planning (OPEP) and effective environmental monitoring programs (as detail in the Operational and Scientific Monitoring Program (OSMP)).

Table 7-15: Hydrocarbon exposure values / thresholds

Exposure level	Threshold	Description
Surface (floating)		
Low	1 g/m^2	Approximates range of socio-economic effects and establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers
Moderate	10 g/m^{2} *	Approximates lower limit for harmful exposures to birds and marine mammals.
High	50 g/m^2	Approximates surface oil slick and informs response planning
Shoreline accumulation		
Low	10 g/m^2	Predicts potential for some socio-economic impact based on potential for exceedance of water quality triggers
Moderate	100 g/m^{2} *	Loading predicts area likely to require clean-up effort
High	1,000 g/m^2	Loading predicts area likely to require intensive clean-up effort

Dissolved (in water)		
Low	10 ppb	Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers
Moderate	50 ppb	Approximates potential toxic effects, particularly sublethal effects to sensitive species
High	400 ppb	Approximates toxic effects including lethal effects to sensitive species
Entrained (in water)		
Low	10 ppb	Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers
High	100 ppb	As appropriate given oil characteristics for informing risk evaluation

Justification for the use of the exposure values presented in Table 7-15 is provided in Appendix E Exploration Permit T/49P Marine Diesel Spill Modelling Report (RPS 2023). It is important to note that the low thresholds used are not ecologically significant and have no observable effect on surface or sub-surface waters shorelines or flora and fauna.

7.6.2.4. Modelling Results for T/49P

Stochastic modelling results for the hypothetical vessel collision scenario within permit area T/49P are presented in the following sections for sea surface floating oil, shoreline, dissolved and entrained hydrocarbons. Deterministic analysis is also presented for the simulations that resulted in the largest volume of oil ashore for T/49P scenarios (for further details see Appendix E).

The extent of potential hydrocarbon exposure at moderate thresholds (instantaneous 1-hour time-based in-water dissolved and entrained) for an MDO spill scenario in T49/P is presented in Figure 7-1. It is important to note that this figure does not represent the predicted extent of any single spill but rather represents the overlay of hundreds of hypothetical spills, to provide a basis for response planning.

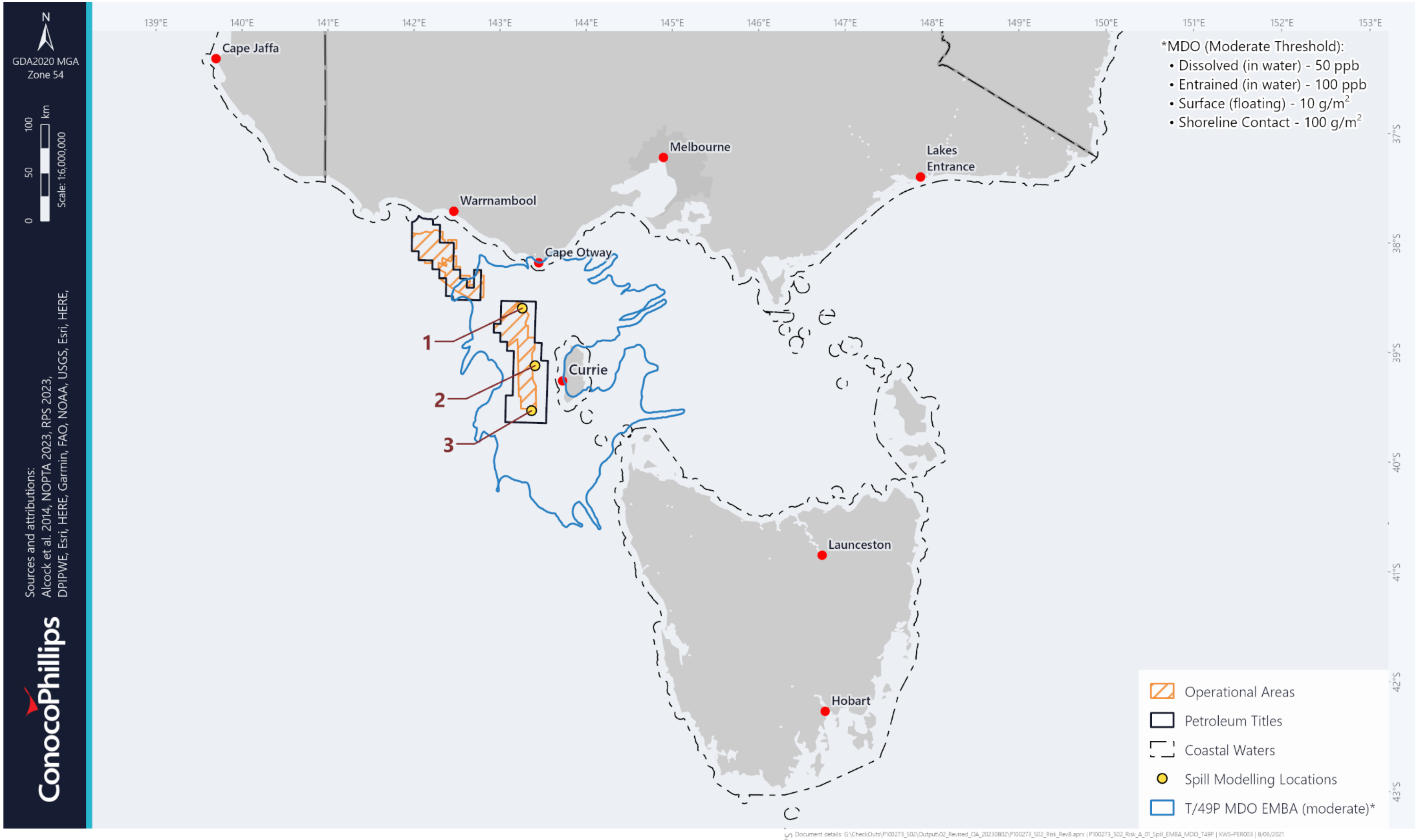


Figure 7-1: MDO moderate threshold EMBA for T/49P (source: RPS 2023)

Sea Surface (Floating) Hydrocarbon Exposure

Moderate (10 g/m^2) sea surface hydrocarbon exposures were predicted to occur out to a maximum distance of 19.2 km from release location 2 in summer and 28.3 km from release location 3 in winter. High hydrocarbon exposures occurred out to a maximum distance of 5.2 km from the source (RPS 2023) (Appendix E).

Moderate floating oil exposure was predicted to occur with 100% probability within:

- The Otway IMCRA, with a minimum time to exposure of 0.04 days in both summer and winter for Location 1.
- The Otway IMCRA and the Zeehan AMP, with a minimum time to exposure of 0.04 days in both summer and winter for Location 2.
- The Otway IMCRA, with a minimum time to exposure 0.04 days in both summer and winter for Location 3.

Shoreline Hydrocarbon Exposure

Shoreline contact at or above the low threshold was predicted to occur within a minimum of 1.5 days for a spill originating from Location 2. The maximum volume of 47.4 m^3 and average volume of 8.3 m^3 of oil ashore, and maximum of 14 km and average of 4.1 km of shoreline exposed at the moderate threshold (100 g/m^3) were also predicted for spills originating from Location 2.

Moderate shoreline hydrocarbon exposure was predicted to occur during winter conditions at:

- King Island (26% probability) within a minimum time of 1.96 days.
- Colac Otway, Kanowna Island and Skull Rock (1% probability) within a minimum time of 8.63 days.

During summer conditions, shoreline contact at moderate threshold was only predicted to occur at King Island from Location 2 (4% probability), with a minimum time of 2.67 days to contact.

Dissolved Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the greatest predicted dissolved hydrocarbon concentration resulting from a spill from any of the three locations was 124 ppb during summer and 100 ppb during winter in the Zeehan AMP (and Otway IMCRA).

The maximum distance from the spill source to a zone of potential moderate dissolved hydrocarbon exposure within surface waters (0-10 m) was 15 km, associated with a release from Location 3 in summer.

Open waters within the Zeehan AMP recorded a probability of 10% and 11% during the summer and winter conditions, respectively, based on the moderate instantaneous threshold. Exposures at the high instantaneous threshold were not predicted at any identified receptors.

Entrained Hydrocarbon In-water Exposure

Within the 0-10 m depth layer, the maximum entrained hydrocarbon exposure (over 1 hour) for the open waters surrounding release Location 2 was 9,750 ppb and 7,673 ppb, during summer and winter conditions, respectively.

The maximum distance from the spill source to a zone of potential high entrained hydrocarbon exposure within surface waters (0-10m) was 157km, associated with a release from Location 3 in winter.

For identified receptors, the probability of exposure to entrained hydrocarbons at or above the high threshold (100 ppb) ranged from 1% (at a range of locations) to 98% (Otway IMCRA) and 92% (Zeehan AMP) during summer and winter conditions.

7.6.2.5. Modelling Results for Southern Extent of VIC/P79

Stochastic modelling results for the hypothetical vessel collision scenario within the southern extent of permit area VIC/P79 are presented in the following sections for sea surface floating oil, shoreline, dissolved and entrained hydrocarbons. Deterministic analysis is also presented for the simulations that resulted in the largest volume of oil ashore for VIC/P79-South scenarios (for further details see Appendix E).

The extent of potential hydrocarbon exposure at moderate thresholds (instantaneous 1-hour time-based in-water dissolved and entrained) for an MDO spill scenario in VIC/P79-South is presented in Figure 7-2. It is important to note that this figure does not represent the predicted extent of any single spill but rather represents the overlay of hundreds of hypothetical spills, to provide a basis for response planning.

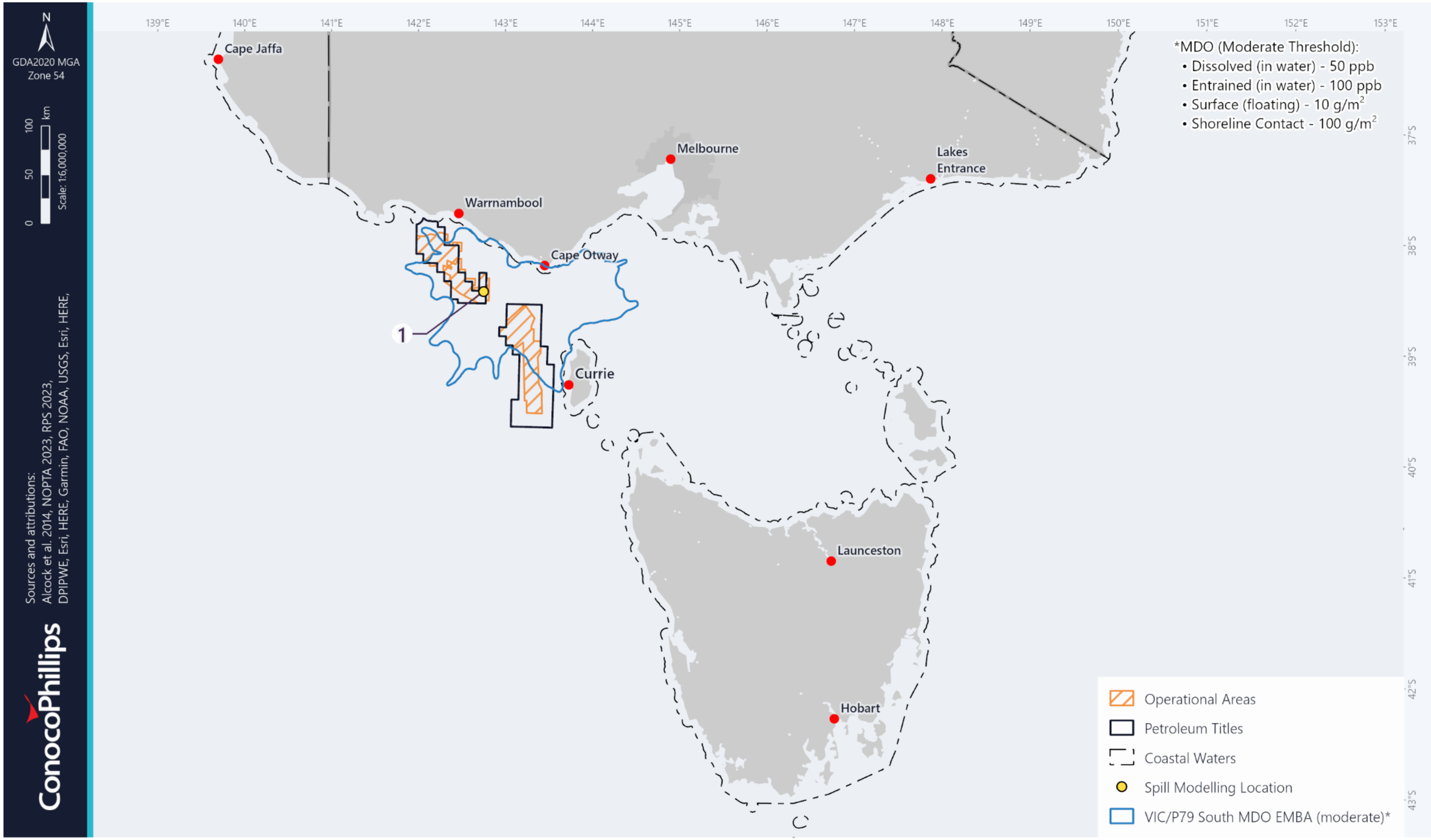


Figure 7-2: MDO moderate threshold EMBA for southern extent of VIC/P79 (source: RPS 2023)

Sea Surface (Floating) Hydrocarbon Exposure

Moderate (10 g/m^2) sea surface hydrocarbon exposures were predicted to occur out to a maximum distance of 12.6 km from release location 1 in summer and 15.9 km from release location 1 in winter. High hydrocarbon exposures occurred out to a maximum distance of 4.3 km from the source in summer (RPS 2023) (Appendix E).

Moderate floating oil exposure was predicted to occur with 100% probability within:

- The Otway IMCRA, with a minimum time to exposure of 0.04 days in both summer and winter from Location 1.

Shoreline Hydrocarbon Exposure

No shoreline contact was predicted to occur above the moderate threshold. Shoreline contact at or above the low threshold was predicted to occur within a minimum of 5 days for a spill originating from Location 1 in winter. The maximum volume of 16.6 m^3 and average volume of 3 m^3 of oil ashore, and maximum of 3 km and average of 1.5 km of shoreline exposed at the moderate threshold (100 g/m^3) were also predicted for spills originating from Location 1.

Moderate shoreline hydrocarbon exposure was predicted to occur during winter conditions at:

- Moyne (2% probability) within a minimum time of 8.5 days.
- Norman Island (1% probability) within a minimum time of 9.71 days.
- South Gippsland (1% probability) within a minimum time of 25.21 days.

Moderate shoreline hydrocarbon exposure was predicted to occur during summer conditions at:

- Colac Otway (1% probability) within a minimum time of 9.38 days.
- Phillip Island (1% probability) within a minimum time of 11.54 days.

Dissolved Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the greatest predicted dissolved hydrocarbon concentration resulting from a spill from the one location was 113 ppb during summer and 94 ppb during winter in the Otway IMCRA.

The maximum distance from the spill source to a zone of potential moderate dissolved hydrocarbon exposure within surface waters (0-10m) was 13 km, associated with a release from Location 1 in summer.

Open waters within the Otway IMCRA recorded a probability of 7% during both summer and winter conditions, respectively, based on the moderate instantaneous threshold. Exposures at the high instantaneous threshold were not predicted at any identified receptors.

Entrained Hydrocarbon In-water Exposure

Within the 0-10 m depth layer, the maximum entrained hydrocarbon low exposure (over 1 hour) for the open waters surrounding release Location 1 was 9,295 ppb and 9,662 ppb, during summer and winter conditions, respectively.

The maximum distance from the spill source to a zone of potential high entrained hydrocarbon exposure within surface waters (0-10 m) was 700 km, associated with a release in winter.

For identified receptors, the probability of exposure to entrained hydrocarbons at or above the high threshold (100 ppb) ranged from 1% (at a range of locations) to 94% (Otway IMCRA) during winter conditions.

7.6.2.6. Modelling Results for Northern Extent of VIC/P79

Stochastic modelling results for the hypothetical vessel collision scenario within northern extent of permit area VIC/P79 are presented in the following sections for sea surface floating oil, shoreline, dissolved and entrained hydrocarbons. The results from the worst-case credible location are detailed below. Deterministic analysis is also presented for the simulations that resulted in the largest volume of oil ashore for VIC/P79-North scenarios (for further details see Appendix E).

The extent of potential hydrocarbon exposure at moderate thresholds (instantaneous 1-hour time-based in-water dissolved and entrained) for an MDO spill scenario in VIC/P79-North is presented in Figure 7-3. It is important to note that this figure does not represent the predicted extent of any single spill but rather represents the overlay of hundreds of hypothetical spills, to provide a basis for response planning.

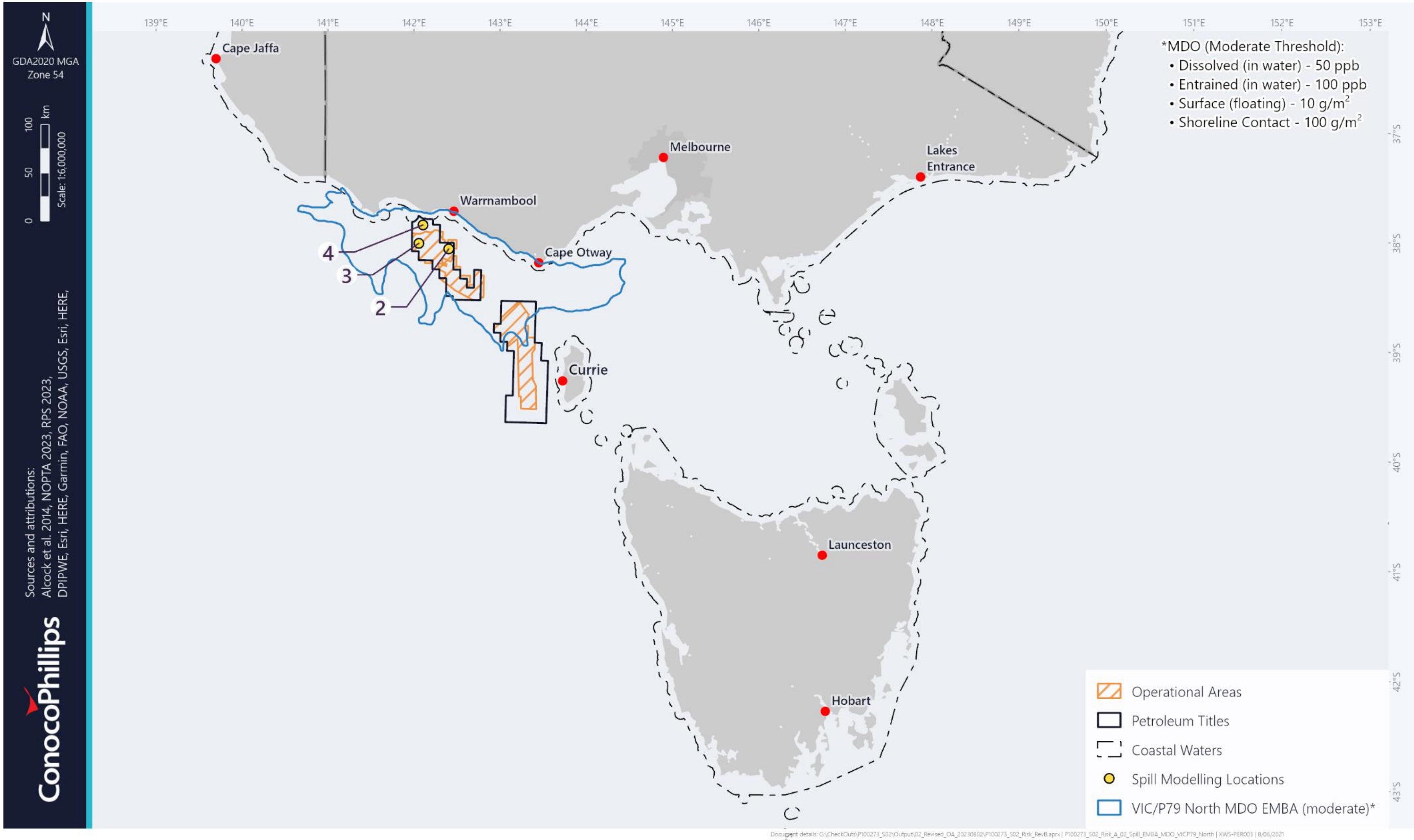


Figure 7-3: MDO moderate threshold EMBA for northern extent of VIC/P79 (source: RPS 2023)

Sea Surface (Floating) Hydrocarbon Exposure

Moderate (10 g/m^2) sea surface hydrocarbon exposures were predicted to occur out to a maximum distance of 21.2 km from release Location 1 in summer, 19.8 km from release Location 2 in winter, and 20.7 km from release Location 3 in winter. High hydrocarbon exposures occurred out to a maximum distance of 5.5 km from the source (RPS 2023) (Appendix E).

Moderate floating oil exposure was predicted to occur with 100% probability within:

- The Otway IMCRA, with a minimum time to exposure of 0.04 days in both summer and winter for Location 1, 2 and 3.

Shoreline Hydrocarbon Exposure

No shoreline contact was predicted to occur above the moderate threshold. Shoreline contact at or above the low threshold was predicted to occur within a minimum of 1.08 days for a spill originating from Location 3 in winter. The maximum volume of 43 m^3 and average volume of 9.5 m^3 of oil ashore was also predicted for spills originating from Location 3, with a maximum of 10 km and average of 4.5 km of shoreline exposed at the moderate threshold (100 g/m^3).

For Location 3, moderate shoreline hydrocarbon exposure was predicted to occur during winter conditions at:

- Colac Otway (3% probability) within a minimum time of 4.46 days
- Corangamite (7% probability) within a minimum time of 2.46 days.
- Lady Julia Percy Island (3% probability) within a minimum time of 1.17 days.
- Laurence Rocks (1% probability) within a minimum time of 3.42 days.
- Moyne (15% probability) within a minimum time of 1.71 days.
- Warrnambool (3% probability) within a minimum time of 1.75 days.

For Location 3, moderate shoreline hydrocarbon exposure was predicted to occur during summer conditions at:

- Corangamite (1% probability) within a minimum time of 5.96 days.
- Glenelg (5% probability) within a minimum time of 4.58 days.
- Lady Julia Percy Island (3% probability) within a minimum time of 3.17 days.
- Moyne (23% probability) within a minimum time of 1.42 days.
- Warrnambool (4% probability) within a minimum time of 3.17 days.

Dissolved Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the greatest predicted dissolved hydrocarbon concentration resulting from a spill from any of the three locations was 68 ppb during summer and 64 ppb during winter in the Otway IMCRA.

The maximum distance from the spill source to a zone of potential moderate dissolved hydrocarbon exposure within surface waters (0-10m) was 24 km, associated with a release from Location 3 in winter.

Open waters within the Otway IMCRA recorded a probability of 10% during the summer from Location 3 and 9% during winter conditions from Location 2, respectively, based on the moderate instantaneous threshold. Exposures at the high instantaneous threshold were not predicted at any identified receptors.

Entrained Hydrocarbon In-water Exposure

Within the 0-10 m depth layer, the maximum entrained hydrocarbon low exposure (over 1 hour) for the open waters surrounding release Location 2 was 7,237 ppb and 8,442 ppb, during summer and winter conditions, respectively.

The maximum distance from the spill source to a zone of potential high entrained hydrocarbon exposure within surface waters (0-10m) was 598 km from Location 3, associated with a release in winter.

For identified receptors, the probability of exposure to entrained hydrocarbons at or above the high threshold (100 ppb) ranged from 1% (at a range of locations) to 44% (Bonney Coast Upwelling) to 94% (Otway IMCRA) during winter conditions from Location 3.

7.6.3. Environmental Impacts

In the event of loss of containment of MDO, the known environmental impacts will include a:

- Change in water quality

A change in water quality can result in a range of environmental impacts from exposure to hydrocarbons, including:

- Change in fauna behaviour
- Injury / mortality to fauna
- Change in ecosystem dynamics and conservation values
- Changes to the functions, interests, or activities of other users.

7.6.4. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of risks associated with a release of MDO, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Values of World heritage properties
- Values of National heritage places
- Ecological character of a declared RAMSAR wetland
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

The release of MDO can cause impacts to ecological, social, economic and cultural values of the marine environment including:

- Changes in fauna behaviour and injury / mortality to fauna, potentially impacting:
    - Plankton
    - Marine invertebrates
    - Fish
    - Seabirds and Shorebirds
    - Marine reptiles
    - Marine mammals (e.g. pinnipeds and cetaceans)
- Changes in ecosystem dynamics, potentially impacting:
    - State protected areas (marine)

    - Australian marine parks including the Zeehan (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386)
    - Key ecological features
    - Wetlands
- Changes to the functions, interests or activities of other users and aesthetic values, potentially including:
    - Tourism (including recreational diving and fishing)
    - Commercial fisheries
    - Coastal habitats and communities, including First Nations heritage and world heritage areas
    - Shipping
    - Offshore Petroleum Activities

Although the EPBC PMST report for the MDO EMBA did not identify any threatened marine invertebrate species or benthic habitats, feedback was received during consultation regarding the impact of a spill on the giant crab fishery (Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421).

7.6.5. Evaluation of Environmental Risks

The likelihood of a loss of containment of MDO is assessed using published general marine operations data and industry specific data. The AMSA Annual Report 2021-22 (AMSA, 2022) documents serious pollution incidents (defined as a Level 2 (or higher) incident in accordance with the National Plan for Maritime Environmental Emergencies) into the marine environment from all marine operations. For all marine operations within Australia, there have been two reported serious marine pollution incidents in the last four years. Reportable loss of containment incidents have been heard of within the industry but are not a common occurrence at the magnitude of a serious pollution event.

Although shipping activity is relatively high in the area (see Section 4.7.4), exclusion zones and navigational aids assist in reducing the likelihood of a collision. Higher traffic occurs in and around ports and harbours, which is where the greatest risk of collision occurs. Consequently, the likelihood of an MDO spill within the operational areas is assessed as **Remote (2)**.

The criteria used to determine the sensitivity of receptors that may be affected by an MDO (and LOWC) release are presented in Table 7-16. The potential consequences of the MDO spill scenario on key receptors within the EMBA are discussed in Table 7-17 to Table 7-25 and the inherent risk rating is calculated for each.

Table 7-16: Criteria used to determine receptor sensitivity in the EMBA

Sensitivity*	Protected areas	Species status	BIA	Coastal habitat sensitivity	Receptors in the EMBA
Low	No State marine protected areas. Commonwealth multiple use zones are the dominant component of protected areas.	Species is EPBC Listed, and impact expected to be limited to individuals with no population level impact. Present in the EMBA only occasionally or as vagrants, with no biologically important behaviours occurring. Populations known to recover rapidly from disturbance.	No BIA (or limited to only a few species of a particular faunal grouping).	Low sensitivity habitat, such as sandy beaches and exposed rocky shores, with rapid recovery from oiling (approximately 1 year or less). Public recreation beaches are not present or not widely used. No harbours or marinas.	• Benthic assemblages • Plankton • Invertebrates • Fish • Sandy beaches • Rocky shores • Non-indigenous heritage
Medium	No State marine protected areas. Little to no Commonwealth special purpose zonation.	Species may be EPBC Listed threatened or vulnerable and impact expected to be limited to individuals with no population level impact. Species may or may not be present at time of activity, however not undertaking biologically important behaviours. Some susceptibility to oiling. Populations may take a moderate time to recover from oiling.	Intersection with one or more BIAs, generally for distribution or foraging rather than breeding.	Moderately sensitive habitat present, such as sheltered rocky rubble coasts, exposed tidal flats, gravel beaches, mixed sand and gravel beaches, with a medium recovery period from oiling (approximately 2–5 years). Public recreation beaches present but not often used. No harbours or marinas.	• Marine reptiles • Seabirds • Coastal habitats and communities • Some cetaceans • Commercial fisheries • Other marine and coastal users • Energy exploration and production • First Nations heritage
High	State marine protected areas present. Commonwealth special purposes zones are the dominant component of the protected area.	Species are EPBC Listed Endangered or Critically Endangered Species known to be present at time of activity, undertaking biologically important behaviours. Known to be susceptible to oiling. Populations may take a long time to recover from oiling.	Significant intersection with one or more BIAs Notable overlap with spatially restricted BIA (e.g. breeding, nesting, migration)	Sensitive habitat present, such as mangrove, salt marshes, and sheltered tidal flats, with long recovery periods from oiling (> 5 years). Public recreation beaches present that are widely used. Busy harbours or marinas.	• Some cetaceans • Pinnipeds • Shorebirds • Aquatic birds • State Marine Protected Areas

* Not to be confused with 'risk rating' which is based on the ConocoPhillips Risk Matrix

Table 7-17: Potential risk of MDO release on benthic assemblages

General sensitivity to oiling – benthic assemblages (excluding marine invertebrates which are assessed in Table 7-19)	
Sensitivity rating of benthic assemblages	**Low**
A description of benthic assemblages in the EMBA is provided in:	Section 4.6.1.1

Marine Flora

Given the nature of the MDO spill scenario being a surface spill, the following assessment has been restricted to assessment of benthic assemblages observed on shallow shelf areas to depth of 30 m (the photic zone). The shallow shelf of the temperate south east region has a high diversity of benthic plant species including kelp, some seagrasses and primarily macroalgae. As such, the focus of the following assessment is on macroalgae components of benthic assemblages.

Studies of offshore benthic seaweeds in the northwest Gulf of Mexico prior to and after the Macondo well blowout at Sackett and Ewing banks (in water depths of 55–75 m) found a dramatic die-off of seaweeds after the spill (60 species pre-spill compared with 10 species post-spill) (Felder et al. 2014). Benthic decapod assemblages (crabs, lobsters, prawns) associated with the seaweeds and benthic substrate also showed a strong decline in abundance at both banks post-spill (species richness on Ewing Bank reduced by 42% and on Sackett Bank by 29%), though it is noted that these banks are exposed to influences from Mississippi River discharges that vary year to year, so definitive links to the oil spill were not possible. It is noted, however, that petroleum residues were observed on Ewing Bank and it is possible that this may have caused localised mortalities, reduced fecundity of surviving female decapods and/or reduced recruitment (Felder et al. 2014). Felder et al (2014) also notes that freshly caught soft-sediment decapod samples caught in early and mid-2011 near the spill site exhibited lesions that were severe enough to cause appendage loss and mortality.

Water quality in benthic habitats exposed to entrained hydrocarbons would be expected to return to background conditions within weeks to months of contact. Several studies have indicated that rapid recovery rates may occur even in cases of heavy oiling (Committee on Oil in the Sea 2003).

Macroalgae (including seaweeds and kelp) are generally limited to growing on intertidal and subtidal hard substrata in shallow waters within the photic zone. As such, they may be exposed to subsurface entrained and dissolved hydrocarbons, however, they are susceptible to surface hydrocarbon exposure more so in intertidal habitats as opposed to subtidal habitats.

The physical effects of smothering, fouling and asphyxiation have been documented from oil contamination in marine plants (Blumer 1971; Cintron et al. 1981). In macroalgae, oil can act as a physical barrier for the diffusion of CO_2 across cell walls (O'Brian & Dixon 1976). The effect of hydrocarbons, however, is largely dependent on the degree of direct exposure and how much of the hydrocarbon adheres to algae, which will vary depending on the oils physical state and relative ‘stickiness’. The morphological features of macroalgae, such as the presence of a mucilage layer or the presence of fine ‘hairs’ will influence the amount of hydrocarbon that will adhere to the algae. A review of field studies conducted after spill events by Connell et al (1981) indicated a high degree of variability in the level of impact, but in all instances, the algae appeared to be able to recover rapidly from even very heavy oiling. The rapid recovery of algae was attributed to the fact that for most algae, new growth is produced from near the base of the plant while the distal parts (which would be exposed to the oil contamination) are continually lost. Other studies have indicated that kelp beds oiled by crude oil had a 90% recovery within 3-4 years of impact, however full recovery to pre-spill diversity may not occur for long periods after the spill (French- McCay 2004).

<table>
<tr><td colspan="3">Intertidal macroalgal beds are more prone to oil spills than subtidal beds because, although the mucous coating prevents oil adherence, oil that is trapped in the upper canopy may be more persistent, which impacts site-attached species. Additionally, when oil sticks to dry fronds on the shore, they can become heavy and break as a result of wave action (IPIECA 2002).
The toxicity of hydrocarbons to macroalgae varies for the different macroalgal life stages, with water-soluble hydrocarbons more toxic (Van Overbeek and Blondeau 1954; Kauss et al. 1973; cited in O'Brien and Dixon 1976). Toxic effect concentrations for hydrocarbons and algae have varied greatly among species and studies, ranging 0.002–10,000 ppm (Lewis & Pryor 2013). The sensitivity of gametes, larva and zygote stages, however, have all proven more responsive to petroleum oil exposure than adult growth stages (Thursby and Steele 2004; Lewis & Pryor 2013).
Entrained hydrocarbon within the water column can affect light qualities and the ability of macrophytes, including seagrasses and macroalgae, to photosynthesise.
Other Benthic Assemblages
Other benthic assemblages expected to occur in shallow shelf areas include rocky reef patches, encrusting bryozoans and sponges. These benthic assemblages are typically low lying and not occurring within intertidal zones, which are regularly exposed on low tide. Further descriptions are provided in Section 4.6.1.1.</td></tr>
<tr><th colspan="3">Potential consequence from an MDO spill</th></tr>
<tr><th>Sea Surface</th><th>Dissolved and Entrained Hydrocarbon In-water</th><th>Shoreline</th></tr>
<tr><td>Marine Flora
Floating life phases of vegetation in western Bass Strait may be exposed to limited areas of moderate hydrocarbons at the sea surface. Given the nature of the spill in this scenario (occurring in high energy waters >20 m deep) limited floating vegetation is expected to be present resulting in consequence to marine flora assemblages to be Minor.
Other Benthic Assemblages
Benthic assemblages are not expected to be exposed to surface (floating) MDO.</td><td>Marine Flora
Only contact at the low and moderate threshold for dissolved hydrocarbons was predicted, with no predicted exposure to high thresholds.
In nearshore waters, where there is greater risk of interaction with photosynthetic benthic assemblage communities, low threshold exposure to dissolved hydrocarbons, which is unlikely to result in ecological impact, is predicted at the King Island (1%) and Otway Ranges (1%). High threshold exposure to entrained hydrocarbons is predicted at Warrnambool Plain (20%), King Island (9%), Glenelg Plain (7%), Reid Rock (5%), Otway Ranges (5%), Otway Plain (4%), Bridgewater (3%) and Black Pyramid (1%).
Due to the low concentrations and physical properties of the hydrocarbons and the well-mixed nature of the waters of the EMBA, coating of benthic assemblages and prolonged exposure to hydrocarbons is considered highly unlikely. Thus, the consequence to marine flora</td><td>Marine Flora
Shoreline accumulation of hydrocarbons at the low threshold is unlikely to have an ecological impact.
Areas of predicted moderate shoreline loading include the coastlines of King Island (26% probability of contact), Moyne (23%), Corangamite (7%), Glenleg (5%), Warrnambool (4%), Lady Julia Percy Island (3%), Colac Otway (3%), Norman Island (1%), Lawrence Rocks (1%), South Gippsland (1%), Phillip Island (1%), Glennie Group (1%), Anser Island (1%), Kanowna Island (1%) and Skull Rock (1%). At a moderate threshold, there may be ecological impacts to benthic assemblages stranded on the shoreline. However, wave action at the shoreline will rapidly disperse and weather the hydrocarbons naturally.</td></tr>
</table>

<table>
<tr><td></td><td>assemblages from exposure to moderate threshold in-water hydrocarbons is Minor.
Other Benthic Assemblages
Within the shallow coastal shelf in-water (dissolved) MDO exposure at low thresholds is predicted, while in-water (entrained) at high thresholds is predicted. The probability of exposure is low (20%), thus, the consequence to other benthic assemblages' communities from exposure to moderate and greater threshold hydrocarbons is minor.</td><td>Therefore, the consequence of exposure to moderate threshold shoreline loading to marine flora assemblages is Minor.
Other Benthic Assemblages
Benthic assemblages are not associated with intertidal areas and are therefore not anticipated to be affected by shoreline MDO exposure.</td></tr>
</table>

Summary of predicted impact level to benthic assemblages	Risk rating
An MDO release has the potential to result in: • Change in ecosystem function • Injury/mortality to biota The extent of the area of impact is limited to coastal waters less than 30 m deep. The consequence of an MDO release on ecosystem function and injury/mortality to benthic assemblage biota has been assessed as **Minor (2)**, based on: • Impacts on benthic assemblages (i.e. marine flora and other) associated with oil smothering, fouling and asphyxiation is expected to be limited based on the following: ○ Common feature of macroalgae is the presence of a mucous coating that prevents oil adherence. ○ Water soluble components of MDO are expected to rapidly weather, reducing the toxicity of the water-soluble portion by the time it enters shallow coastal waters where interaction with benthic assemblages attached to seabed are more likely. • Intertidal macroalgal beds are more prone to oil spills than subtidal beds, however, given the exposed nature of these shorelines weathering of hydrocarbons is expected to be rapid, limiting the duration of exposure. • Macroalgae tend to exhibit rapid recovery from oil spill due to common growth habitat where new growth occurs near the base of the plant while the distal parts (which would be exposed to the oil contamination) are continually lost. • An MDO release is considered to result in medium-term and localised impacts to a small portion of benthic habitat that is widely representative of the region, with no population level impact expected. • Conservation values of protected areas associated with benthic assemblages are not predicted to be affected by an MDO release, including at: the Apollo AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision resulting in MDO release is very low. If an incident occurred, impacts would be restricted to localised coastal areas within the photic zone (up to 30 m depth) and would be unlikely to impede the recovery of benthic assemblages, including those identified as TECs.	**Benthic Assemblages** **Low (RR I)**

Table 7-18: Potential risk of MDO release on plankton

General sensitivity to oiling – plankton	
Sensitivity rating of plankton	**Low**
A description of plankton in the EMBA is provided in:	Section 4.6.3
Plankton are found in nearshore and open waters beneath the surface and form the basis for the marine food web. These organisms migrate vertically through the water column to feed in surface waters at night and, when doing so, it is possible they may be exposed to surface hydrocarbons and, to a greater extent, hydrocarbons dissolved or entrained in the water column (NRDA 2012). Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate rapidly due to their small size and high surface area to volume ratio (Hook et al. 2016). If phytoplankton are exposed to hydrocarbons at the sea surface, this may directly affect their ability to photosynthesise via smothering and would have implications for the next trophic level in the food chain (e.g., small fish) (Hook et al. 2016). In addition, the presence of surface hydrocarbons may result in a reduction of light penetrating the water column, which may again affect the rate of photosynthesis, particularly in instances where there is prolonged presence of surface hydrocarbons over an extensive area such that the phytoplankton was restricted from exposure to light, which is not predicted for an MDO release. In turn, this may affect the rate of photosynthesis and inhibit growth, depending on the concentration range. For example, photosynthesis is stimulated by low concentrations of oil in the water column (10-30 ppb) but becomes progressively inhibited above 50 ppb. Conversely, photosynthesis can be stimulated below 100 ppb for exposure to weathered oil (Volkman et al. 2004). Zooplankton (microscopic animals such as rotifers, copepods and krill that feed on phytoplankton) are vulnerable to hydrocarbons due to their small size and high surface area to volume ratio, along with (in many cases) their high lipid content (that facilitates hydrocarbon uptake and bioaccumulation) (Hook et al. 2016). Water column organisms that come into contact with oil risk exposure through ingestion, inhalation and dermal contact (NRDA 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook et al. 2016). Plankton are generally abundant and widely dispersed in the upper layers of the water column, meaning that a spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Adult krill are found in surface waters to depths of 350 m; they have occasionally been found as deep as 600 m and are in deeper waters during winter months; whereas larvae begin life near the sea floor, up to depths of 2000 m, and ascend toward the surface as development progresses over several larval stages, each stage lasting 8-15 days (Gierak, R. 2023). Krill form schools with an average thickness of 15 m and length of 100 m, but may extend to 100 km (Gierak, R. 2023). The distribution of krill is closely linked to spatial and temporal patterns in primary production by phytoplankton, which in turn is closely linked to the supply of nutrients and oceanographic processes (Fathom Pacific 2023). Variations in the temporal scale of oceanographic processes typical of the ecosystem have a greater influence on plankton communities than the direct effect of spilled hydrocarbons. This is because reproduction by survivors or migration from unaffected areas would be likely to rapidly replenish any losses from permanent zooplankton (Volkman et al. 2004). Field observations from oil spills show minimal or transient effects on marine plankton (Volkman et al. 2004). Once background water quality conditions have re-established, the plankton community will take weeks to months to recover (ITOPF 2011a), allowing for seasonal influences on the assemblage characteristics.	

Potential consequence from an MDO spill		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Plankton found in open water of the EMBA are expected to be widely represented in the Bass Strait and Otway region. Plankton in the upper water column are likely to be directly (e.g., through smothering and ingestion) and indirectly (e.g., toxicity from decrease in water quality and bioaccumulation) affected by dissolved, entrained and floating hydrocarbons. Extensive areas of dense surface krill swarms are known to seasonally occurring in the area and, as krill can occur at any depth, swarms at depth are also likely. Once background water quality conditions are re-established, following natural weathering and dispersion of hydrocarbons, populations are expected to recover rapidly due to recruitment from surrounding and deeper waters and reproduction by survivors. Thus, consequence on plankton populations from exposure to moderate threshold hydrocarbons is **minor**.		Plankton are found in the water column; not on the shoreline; therefore, there is no exposure pathway expected.

Summary of predicted impact level to plankton	Risk rating
An MDO release has the potential to result in: • Fauna injury/mortality The extent of the area of impact is predicted to be limited to photic portions of the water column (i.e. up to 30 m depth) due to the expected higher concentration of plankton within this area and due to nature of the spill scenario being a surface release. The consequence of an MDO release associated with fauna (plankton) injury/mortality has been assessed as **Minor (2)**, based on: • Phytoplankton may be impacted by limited photosynthetic (growth) capacity as a result of direct smothering or limited ability for light to penetrate the water column. While zooplankton may be impacted by toxicity through direct contact (ingestion, inhalation and dermal contact) resulting in injury or mortality. • Due to their small size and high surface area to volume ratio, plankton tend to rapidly accumulate the water-soluble portion of MDO, however, due to the abundant nature of plankton within the upper water column, an MDO spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. • Plankton exhibit rapid recovery due to mass spawning behaviours of many species with planktonic life phase, along with ocean current facilitating migration from unaffected areas. It is expected that plankton communities will recovery over weeks to months once background water quality conditions have re-established. • Conservation values of protected areas associated with plankton are not expected to be affected by an MDO release, including at: Apollo AMP, Beagle AMP, Boags AMP, Franklin AMP, Murray AMP, Nelson AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF, Big Horseshoe Canyon KEF or Upwelling East of Eden KEF. • The magnitude of potential risk associated with an MDO release is considered to result in short-term and localised impacts, representing a small portion of the plankton population that is widely representative of the region, with no population level impact expected. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of	**Plankton** **Low (RR I)**

unplanned vessel collision resulting in MDO release is very low. If an incident occurred, it would be restricted to upper water column within the photic zone (up to 30 m depth) and would be unlikely to impede the recovery of plankton and associated food chains within the South-East bioregion.	

Table 7-19: Potential risk of MDO release on marine invertebrates

General sensitivity to oiling – marine invertebrates (Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421)	
Sensitivity rating of marine invertebrates	**Low**
A description of marine invertebrates in the EMBA is provided in:	Section 4.6.4
The primary modes of exposure for marine invertebrate communities in oil spills include: • Direct exposure to dispersed oil (e.g., physical smothering) where bottom discharges stay at the ocean bottom • Direct exposure to dispersed and non-dispersed oil (e.g., physical smothering) where oil sinks down from higher depths of the ocean • Direct exposure to dispersed and non-dispersed oil dissolved in sea water and/or partitioned onto sediment particles • Indirect exposure to dispersed and non-dispersed oil through the food web (e.g., uptake of oiled plankton, detritus, prey, etc.) (NRDA 2012) • Acute or chronic exposure through surface contact and/or ingestion can result in toxicological risks. Entrained and dissolved hydrocarbons can have negative impacts on marine invertebrates and associated larval forms. Impacts to some adult species (e.g. crustaceans) is reduced as a result of the presence of an exoskeleton, while others with no exoskeleton and larval forms may be more prone to impacts. Localised impacts to larval stages may occur which could impact on population recruitment. If invertebrates are contaminated by hydrocarbons, tissue taint can remain for several months, although taint may eventually be lost. For example, it has been demonstrated that it took 2-5 months for lobsters to lose their taint when exposed to a light hydrocarbon (NOAA 2002) (see 'Commercial Fisheries' assessment, Table 7-24). Exposure to microscopic oil droplets may also impact aquatic biota either mechanically (especially filter feeders) or act as a conduit for exposure to semi-soluble hydrocarbons (that might be taken up by the gills or digestive tract) (McCay-French 2009). Toxicity is primarily attributed to water soluble PAHs, specifically the substituted naphthalene (C_2 and C_3) as the higher C-ring compounds become insoluble and are not bioavailable. ANZECC/ARMCANZ (2000) identifies the following 96-hr LC50 concentrations (concentrations that kill 50% of test animals during a 96 hour observation period) for naphthalene (a key PAH dissolved phase toxicant in crude oils): • For the bivalve mollusc, *Katelysia opima*, a concentration of 57,000 ppb • For six species of marine crustaceans, a concentration between 850 and 5,700 ppb. Other possible impacts from the presence of dispersed and non-dispersed oil include effects of oxygen depletion in bottom waters due to bacterial metabolism of oil (and/or dispersants), and light deprivation under surface oil (NRDA 2012). Water quality in benthic habitats exposed to entrained hydrocarbons would be expected to return to background conditions within weeks to months of contact. Several studies have indicated that rapid recovery rates may occur even in cases of heavy oiling (Committee on Oil in the Sea 2003).	

Potential consequence from an MDO spill		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Adult marine invertebrates and larvae usually reside within benthic substrates and pelagic waters, rarely reaching the water's surface in their life cycle, and are unlikely to be exposed except at locations where surface oil reaches shorelines. Refer to shoreline MDO exposure for further description of potential risks.	Adult marine invertebrates and larvae usually reside within benthic substrates and pelagic waters. Modelling predicts impact associated with moderate dissolved and entrained MDO exposure is limited to shallow waters and, therefore, invertebrate benthic habitats < 30 m deep. In nearshore waters, low threshold exposure to dissolved hydrocarbons, which is unlikely to result in ecological impact, is predicted at the King Island (1%) and Otway Ranges (1%). High threshold exposure to entrained hydrocarbons is predicted at Warrnambool Plain (20%), King Island (9%), Glenelg Plain (7%), Reid Rock (5%), Otway Ranges (5%), Otway Plain (4%), Bridgewater (3%) and Black Pyramid (1%). Due to the low concentrations and physical properties of the hydrocarbons and the well-mixed nature of the waters of the EMBA, coating of invertebrates and prolonged exposure to hydrocarbons is considered highly unlikely. Thus, the consequence to invertebrate communities from exposure to moderate threshold dissolved and entrained hydrocarbons is **Minor**.	Invertebrates are expected to be most exposed to shoreline MDO exposure, where surface oil reaches shorelines. Areas of predicted moderate shoreline loading, which is likely to have an ecological impact, include the coastlines of King Island (26% probability of contact), Moyne (23%), Corangamite (7%), Glenleg (5%), Warrnambool (4%), Lady Julia Percy Island (3%), Colac Otway (3%), Norman Island (1%), Lawrence Rocks (1%), South Gippsland (1%), Phillip Island (1%), Glennie Group (1%), Anser Island (1%), Kanowna Island (1%) and Skull Rock (1%). Due to the low concentrations and physical properties of the weathered hydrocarbons expected to wash up on shorelines and exposed nature of these shorelines, coating of invertebrates and prolonged exposure to hydrocarbons is considered highly unlikely. Thus, the consequence to invertebrate communities from exposure to moderate threshold hydrocarbons at the shoreline is **Minor**.

Summary of predicted impact level to marine invertebrates	Risk rating
An MDO release has the potential to result in: • Change in fauna behaviour • Injury/mortality to fauna The extent of the area of impact is predicted to be limited to shallow benthic habitats and areas of shoreline exposure. The consequence of MDO release injury/mortality or change in behaviour of individual invertebrates has been assessed as **Minor (2)**, based on: • Limited exposure to large quantities of unweathered MDO, as such less opportunity for smothering or toxicity impacts due to distance from Operational Areas to shallow habitat and shorelines.	**Marine Invertebrates** **Low (RR I)**

• Planktonic phase of invertebrates, although expected to be more vulnerable than adult phase to presence of in-water MDO exposure, are expected to exhibit rapid recovery rate due to mass spawning behaviours of many species, along with ocean current facilitating migration from unaffected areas. Whereby it is expected that plankton communities will establish over weeks to months once background water quality conditions have re-established. As such any impact on larval phased is expected to be localised and of short duration. • The magnitude of potential risk associated with an MDO release is considered to result in medium-term and localised impacts on a small portion of the invertebrate population (in shallow waters), with no population level impact expected. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision resulting in MDO release is very low. If an incident occurred, it would be restricted to invertebrate habitats in shallower water and shoreline and would be unlikely to impede the recovery of invertebrates and associated food chains within the South-East bioregion.	

Table 7-20: Potential risk of MDO release on fish

General sensitivity to oiling – fish	
Sensitivity rating of fish	**Low**
A description of fish in the EMBA is provided in:	Section 4.6.5
Demersal species may be susceptible to oiled sediments, particularly species that are site-restricted. While pelagic species that occupy the water column are more susceptible to entrained and dissolved hydrocarbons. However, generally these species are highly mobile and as such are not likely to suffer extended exposure due to their patterns of movement. The exception would be in areas such as reefs and other seabed features where species are less likely to move away into open waters (i.e., site-attached species). Fish are exposed to in-water hydrocarbons through a variety of pathways, including: • Direct dermal contact (e.g. swimming through oil or waters with elevated dissolved hydrocarbon concentrations and other constituents, with diffusion across their gills (Hook *et al*. 2016)) • Ingestion (e.g. directly or via food base, fish that have recently ingested contaminated prey may themselves be a source of contamination for their predators), and • Inhalation (e.g. elevated dissolved contaminant concentrations in water passing over the gills). Exposure to hydrocarbons at the surface or entrained or dissolved in the water column can be toxic to fish. Studies have shown a range of impacts including changes in abundance, decreased size, inhibited swimming ability, changes to oxygen consumption and respiration, changes to reproduction, immune system responses, DNA damage, visible skin and organ lesions and increased parasitism. However, many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation of contaminants in the food web (and human exposure to contaminants through the consumption of seafood) (NRDA 2012).	

Sub-lethal impacts in adult fish include altered heart and respiratory rates, gill hyperplasia, enlarged liver, reduced growth, fin erosion, impaired endocrine systems, behavioural modifications and alterations in feeding, migration, reproduction, swimming, schooling and burrowing behaviour (Kennish 1996). However, fish are highly mobile and unlikely to remain in the area of a spill for long enough to be exposed to sub-lethal doses of hydrocarbons.

Fish are most vulnerable to hydrocarbons during their embryonic, larval and juvenile life stages. Eggs and larvae of many fish species are highly sensitive to oil exposure, resulting in decreased spawning success and abnormal larval development (see 'Plankton' assessment, Table 7-18).

Since fish and sharks do not generally break the sea surface, the impacts of surface hydrocarbons to fish and shark species are unlikely to occur. Near the sea surface, fish are able to detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Volkman *et al*. 2004). As a result, wide-ranging pelagic fish of the open ocean generally are not highly susceptible to impacts from surface hydrocarbons. Adult fish kills, reported after oil spills, occur mainly to shallow water, near-shore benthic species (Volkman *et al*. 2004).

Hydrocarbons in the water column can physically affect fish with high site fidelity (or that cannot move out of harm's way) exposed for an extended duration (weeks to months) by coating of gills, leading to lethal and sub-lethal effects from reduced oxygen exchange and coating of body surfaces that may lead to increased incidence of irritation and infection. Fish may also ingest hydrocarbon droplets or contaminated food, leading to reduced growth (Volkman *et al*. 2004).

The threshold value for species toxicity in the water column is based on global data from French et al. (1999) and French-McCay (2002, 2003), which showed that species sensitivity (fish and invertebrates) to dissolved aromatics exposure >4 days (96-hour LC50) under different environmental conditions varied from 6 to 400 µg/L (ppb), with an average of 50 ppb. This range covered 95% of aquatic organisms tested, which included species during sensitive life stages (eggs and larvae). Based on scientific literature, a minimum threshold of 6 ppb over 96 hours or equivalent was used to assess in-water low exposure zones, respectively (Engelhardt 1983; Clark 1984; Geraci and St Aubin 1988; Jenssen 1994; Tsvetnenko 1998). French- McCay (2002) indicates that an average 96-hour LC50 of 50 ppb could serve as an acute lethal threshold to 50%.

Studies of impacts on bony fishes report that light, volatile oils are likely to be more toxic to fish. Many studies conclude that exposure to PAHs and soluble compounds are responsible for the majority of toxic impacts observed in fish (e.g., Carls *et al*. 2008; Ramachandran *et al*. 2004). A range of lethal and sub-lethal effects to fish in the larval stage has been reported at water-accommodated fraction (WAF) hydrocarbon concentrations (48-hour and 96-hour exposures) of 0.001 to 0.018 ppm during laboratory exposures (Carls *et al*. 2008; Gala 2001). In contrast, wave tank exposures reported much higher lethal concentrations (14-day LC50) up to 1.9 ppm for herring embryos and up to 4.3 ppm for juvenile cod (Lee *et al*. 2011).

Toxicity in adult fish has been reported in response to crude oils, HFO and diesel (Holdway 2002; Shigenaka 2011). Uptake of hydrocarbons has been demonstrated in bony fish after exposure to the water-soluble fraction of between 24 and 48 hours. Danion et al (2011) observed PAH uptake of 148 µg/kg-1 after 48-hour exposures to PAH from Arabian Crude at high concentrations of 770 ppm. Davis et al (2002) report detectable tainting of fish flesh after a 24-hour exposure at crude concentrations of 0.1 ppm, marine fuel oil concentrations of 0.33 ppm and diesel concentrations of 0.25 ppm. The majority of studies, either from laboratory trials or of fish collected after spill events (including the Hebei Spirit, Macondo, and Sea Empress spills), find evidence of elimination of PAHs in fish tissues returning to reference levels within two months of exposure (Challenger and Mauseth 2011; Davis *et al*. 2002; Gagnon & Rawson 2011; Gohlke *et al*. 2011; Jung 2011; Law 1997; Rawson *et al*. 2011) (see 'Commercial Fisheries' assessment, see Table 7-24).

The toxicity of dissolved hydrocarbons and dispersed oil to fish species has been the subject of a number of laboratory studies (AMSA 1998). Generally, concentrations in the range of 0.1–0.4 mg/L dispersed oil have been shown to cause fish deaths in laboratory experiments (96-hour LC50). No reported studies of the impacts of oil spills on cartilaginous fish (including sharks, rays and sawfish) were found in the literature. It is not known how the data on the sensitivity of bony fishes would relate to toxicity in cartilaginous fishes.

The assessment of effects on fish species in the Timor Sea as a result of the Montara well blowout (a light gas condensate), conducted from November 2009 to November 2010 undertaken by Gagnon & Rawson (2011), found that of the species studied (mostly Goldband Snapper *Pristipomoides multidens*, Red Emperor *Lutjanus sebae*, Rainbow Runner *Elegatis bipinnulata* and Spanish Mackerel *Scomberomorus commerson*), all 781 specimens were in good physical health at all sites. Results show that:

- Phase 1 study (November 2009, immediately after the blowout ceased) – indicated that in the short-term, fish were exposed to and metabolised petroleum hydrocarbons, however no consistent adverse effects on fish health or their reproductive activity were detected.
- Phase 2 study (March 2010, 5 months after the blowout ceased) – indicated continuing exposure to petroleum hydrocarbons, as detected by elevated liver detoxification enzymes and PAH biliary metabolites in three out of four species collected close to the MODU, and elevated oxidative DNA damage.
- Phase 3 study (November 2010, 12 months after the blowout ceased) – showed a trend towards a return to reference levels with often, but not always, comparable biomarker levels in fish collected from reference and impacted sites. This evidence of exposure to petroleum hydrocarbons at sites close to the spill location suggest an ongoing trend toward a return to normal biochemistry/physiology (Gagnon & Rawson 2011).

The main finding of the Gagnon & Rawson (2011) study concluded that there were no detectable petroleum hydrocarbons found in the fish muscle samples, limited ill effects were detected in a small number of individual fish, and no consistent adverse effects of exposure on fish health could be detected within two weeks following the end of the well release. Notwithstanding, fishes from close to the Montara well, collected seven months after the discharge began, showed continuing exposure to hydrocarbons in terms of biomarker responses. Two years after the discharge, biomarker levels in fishes had mostly returned to reference levels, except for liver size. However, this was potentially attributed to local nutrient enrichment, or to past exposure to hydrocarbons. Fishes near Heyward Shoal, approximately 100 km south-west of the Montara well, had elevated biomarker responses indicating exposure to hydrocarbons, but were collected close to the Cornea natural hydrocarbon seep. Studies on the Montara discharge have shown recovery in terms of the abundance and composition of fishes, and toxicological and physiological responses of fishes.

Sampling from January 2010 to June 2011 by the University of South Alabama and Dauphin Island Sea Lab found no significant evidence of diseased fish in reef populations off Alabama or the western Florida Panhandle as a result of the Macondo well blowout in the Gulf of Mexico (BP 2014).

No reports of oil spills in open waters have been reported to cause fish kills (though mortality in aquaculture pens), which is likely to be because vertebrates can rapidly metabolise and excrete hydrocarbons (Hook *et al*. 2016).

Recovery of fish assemblages depends on the intensity and duration of an unplanned discharge, the composition of the discharge and whether dispersants are used, as each of these factors influences the level of exposure to potential toxicants. Recovery would also depend on the life cycle attributes of fishes. Species that are abundant, short-lived and highly fecund may recover rapidly. However less abundant, long-lived species may take longer to recover. The range of movement of fishes will also influence recovery. The nature of the receiving environment would influence the level of impact on fishes.

White Shark (EPBC Listed: Vulnerable, Migratory, Marine)

White shark foraging and distribution BIA overlaps low, moderate and high surface (floating) and in-water thresholds. White shark breeding BIA overlaps low surface (floating) and in-water thresholds.

Grey Nurse Shark (EPBC Listed: Critically Endangered)

Grey nurse shark foraging and migration BIA overlaps low surface (floating) and in-water thresholds.

Australian Grayling (EPBC Listed: Vulnerable, Migratory)

<table>
<tr><td colspan="4">The Australian Grayling is endemic to south-eastern Australia, including Victoria, Tasmania and New South Wales, and is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, and freshwater rivers and streams as adults. The National Recovery Plan for this species identifies several rivers in the following bioregions which overlap with the low in-water exposure thresholds as important habitats:
• South East Corner, Victoria
• South East Coastal Plain, Victoria
• Tasmanian West, Tasmania
• King Island, Tasmania
Blue Warehou (EPBC Listed: Conservation Dependant)
Blue Warehou are a bentho-pelagic species that inhabits continental shelf and slope waters, usually aggregating close to the seabed.</td></tr>
<tr><th colspan="4">Potential consequence from an MDO spill</th></tr>
<tr><th>Sea Surface</th><th>Dissolved and Entrained Hydrocarbon In-water</th><th colspan="2">Shoreline</th></tr>
<tr><td>Moderate and high threshold exposure MDO is predicted at the sea surface. Fish species in the water column and syngnathid species associated with rafts of floating seaweed may come into contact with surface oil. The maximum distance of moderate exposure threshold from the release site (representing the point at which harmful effects may be encountered) represents a small area of the sea surface in comparison to the wider Bass Strait.
However, the majority of fish species tend to remain in the mid-pelagic zone and are not likely to come into contact with floating hydrocarbons on the sea surface. Due to this reduced likelihood of exposure for the majority of fish species present in the EMBA, the consequence of MDO on the sea surface to fish is Minor.</td><td>There is an 11% probability of moderate exposure to in-water (dissolved) hydrocarbons at the Zeehan AMP, and 92%, 35% and 4% probability of high exposure to in-water (entrained) hydrocarbons at Zeehan AMP, Apollo AMP and Franklin AMP, respectively. Noting, however, this exposure was limited to 10 m depth.
This threshold of exposure represents the possibility of sublethal impacts to chronically exposed fish species. However, NOAA (2013) and ITOPF (2011a) state that hydrocarbon spills in open water are so rapidly diluted that fish kills are rarely observed.
Fish such as the white shark, shortfin mako and porbeagle shark spend most of their time in the water column. As highly mobile species, they are unlikely to remain in one area for long periods of time, which minimises the risk that they would be exposed to toxic levels of hydrocarbons for the length of time necessary to impart a lethal impact. Given that the release occurs at the surface into the generally well-mixed waters of Bass Strait, along with the high and rapid rate of MDO weathering, the consequence of an MDO spill to fish in the water column is Minor.</td><td colspan="2">Given fish and sharks marine existence, shoreline hydrocarbons are not applicable.</td></tr>
<tr><th colspan="3">Summary of predicted impact level to fish</th><th>Risk rating</th></tr>
<tr><td colspan="3">An MDO release the potential to result in:
• Change in fauna behaviour</td><td><u>Fish</u>
Low (RR I)</td></tr>
</table>

• Injury/mortality to fauna
The extent of the area of impact is predicted to be limited to in-water exposure of fish in the upper water column (30 m depth). The consequence of an MDO release on injury/mortality or change in behaviour of individual fish has been assessed as **Minor (2)**, based on:
• Risk of direct contact, ingestion or inhalation is largely determined by behaviours and habitat preferences of fish species. Those at greatest risk of such impacts display limited mobility or high site fidelity. Given the nature of spill, being a surface release in offshore waters 53 – 500 m deep, benthic species or those with high site fidelity are not expected to be exposed to a high threshold. Pelagic fish are more likely to interact with unweathered MDO but are highly mobile and unlikely to remain in the area long enough to be exposed to sub-lethal doses.
• Fish are able to detect and avoid contact with surface slicks, reducing the likelihood of mass fish mortalities in the event of a hydrocarbon spill in open waters. Toxicity impacts associated with an MDO release are expected to be less severe in distant coastal waters, with no high threshold for surface hydrocarbons expected within State waters and the majority of MDO accumulated along shorelines expected to be highly weathered.
• Fish species that are abundant, short-lived and highly fecund are expected to recover rapidly. However less abundant, long-lived species may take longer to recover.
• Planktonic life phases, though more susceptible to toxicity effect, tend to exhibit rapid recovery due to mass spawning behaviours of many species and ocean current facilitating migration from unaffected areas. It is expected that plankton communities will establish over weeks to months once background water quality conditions have re-established (see 'Plankton' assessment, Table 7-18).
• The Recovery Plans for species identified above as present in the EMBA do not explicitly identify 'oil spill', as a key threat. However, they do make relevant references including the following:
  ○ National Recovery Plan for the Australian Grayling (*Prototroctes maraena*) identifies poor water quality as a threatening process and a source of habitat degradation. Specific river systems have been identified as important habitat for long term survival within NSW, Victoria and Tasmania and several rivers overlap low in-water exposure thresholds.
  ○ Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) identifies habitat degradation (e.g. through pollution) as a threat.
  ○ Recovery Plan for the White Shark (*Carcharodon carcharias*) identifies habitat degradation (e.g. through pollution) as a threat.
• The white shark has a low occurrence distribution BIA (which extends to all EEZ waters adjacent to their coastal distribution in Australia) and a foraging BIA that overlaps the EMBA. However, white shark presence is expected to be largely transitory or short term in nature.
• Conservation values of protected areas associated with fish are not expected to be affected by of MDO release, including at: Apollo AMP, Beagle AMP, Boags AMP, Franklin AMP, Murray AMP, Nelson AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF, Big Horseshoe Canyon KEF or Upwelling East of Eden KEF.
• An MDO release is considered to result in short-term (7 to 12 months) and localised impacts, on a small portion of the fish population that is widely represented in the region and a small portion of the total BIA for species identified, with no population level impact expected.
Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision resulting in MDO release is very low. If an incident occurred, impacts would largely be restricted to upper water column	

and coastal areas and are expected to be restricted to individual fauna and unlikely to impede the recovery of a protected species or any associated food chains within the South-East bioregion.	

Table 7-21: Potential risk of MDO release on birds

General sensitivity to oiling – birds	
Sensitivity rating of seabirds	**Medium**
Sensitivity rating of shorebirds	**High**
Sensitivity of aquatic birds	**High**
A description of birds in the EMBA is provided in:	Section 4.6.7
Seabirds, shorebirds and aquatic birds are sensitive to the impacts of oiling, with their vulnerability arising from the fact that they cross the air-water interface to feed, while their shoreline habitats may also be oiled (Hook *et al*. 2016). Species that raft together in large flocks on the sea surface are particularly at risk (ITOPF 2011a). Toxic effects on birds may result where the oil is ingested as the bird attempts to preen its feathers, and the preening process may spread oil over otherwise clean areas of the body (ITOPF 2011a). Whether this toxicity ultimately results in mortality will depend on the amount consumed and other factors relating to the health and sensitivity of the bird. Birds that are coated in oil also suffer from damage to external tissues including skin and eyes, as well as internal tissue irritation in their lungs and stomachs. Breeding seabirds may be directly exposed to oil via a number of potential pathways. Any direct impact of oil on terrestrial habitats has the potential to contaminate birds present at the breeding sites (Clarke 2010). Bird eggs may also be damaged if an oiled adult sits on the nest. Fresh crude was shown to be more toxic than weathered crude, which had a medial lethal dose of 21.3 mg/egg (Clarke 2010). Studies of contamination of duck eggs by small quantities of crude oil, mimicking the effect of oil transfer by parent birds, have been shown to result in mortality of developing embryos. Engelhardt (1983), Clark (1984), Geraci & St Aubin (1988) and Jenssen (1994) indicated that the threshold thickness of oil that could impart a lethal dose to some intersecting wildlife individual is 10 µm (approximately10 g/m^2). Scholten *et al* (1996) indicates that a layer 25 µm thick would be harmful for most birds that contact the slick. **Seabirds** Birds foraging at sea have the potential to directly interact with oil on the sea surface some considerable distance from breeding sites in the course of normal foraging activities. Species most at risk include those that readily rest on the sea surface (such as shearwaters) and surface plunging species such as terns and boobies. As seabirds are top order predators, any impact on other marine life (e.g., pelagic fish) may disrupt and limit food supply both for the maintenance of adults and the provisioning of young. In the case of seabirds, direct contact with hydrocarbons is likely to foul plumage, which may result in hypothermia due to a reduction in the ability of the bird to thermo-regulate and impaired water-proofing (ITOPF 2011a). A bird suffering from cold, exhaustion and a loss of buoyancy (resulting from fouling of plumage) may dehydrate, drown or starve (ITOPF 2011a; DSEWPaC 2011; AMSA 2013). It may also result in impaired navigation and flight performance (Hook *et al*. 2016). Increased heat loss as a result of a loss of water-proofing results in an increased metabolism of food reserves in the body, which is not countered by a	

corresponding increase in food intake, and may lead to emaciation (DSEWPaC 2011). The greatest vulnerability in this case occurs when birds are feeding or resting at the sea surface (Peakall *et al*. 1987). In a review of 45 marine hydrocarbon spills, there was no correlation between the numbers of bird deaths and the volume of the spill (Burger 1993).

Shorebirds

Shorebirds are likely to be exposed to oil when it directly impacts their intertidal feeding habitat. Shorebird species foraging for invertebrates on exposed sand and mud flats at lower tides will be at potential risk of both direct impacts through contamination of individual birds (ingestion or soiling of feathers) and indirect impacts through the contamination of foraging areas that may result in a reduction in available prey items (Clarke 2010).

Aquatic birds

Penguins may be especially vulnerable to oil because they spend a high portion of their time in the water and readily lose insulation and buoyancy if their feathers are oiled. The Iron Baron vessel spill, of 325 tonnes of bunker fuel in Tasmania in 1995, is estimated to have resulted in the death of up to 20,000 penguins (Hook *et al*. 2016).

A little penguin breeding BIA occurs at Christmas Island, Tasmania and represents part of the King Island Important Bird Area (IBA). Breeding typically occurs from September to February, but some birds reside at the colony all year round. The Bass Strait supports approximately 60% of the known breeding population, with additional breeding BIAs located at Three Hummock Island (Tasmania), Hunter Island (Tasmania), Albatross Island (Tasmania), Black Pyramid (Tasmania), Councillor Island (Tasmania), Sisters Island (Tasmania), Egg Island (Tasmania) and Phillip Island (Victoria).

Other Important Coastal Habitats

The following Listed RAMSAR wetlands are exposed to low threshold for entrained (in-water) MDO:

- Piccaninnie Ponds Karst, Victoria
- Glenleg Estuary and Discovery Bay Wetlands, Victoria
- Port Phillip Bay (Western Shoreline) and Bellarine Peninsula, Victoria
- Western Port, Victoria
- Lavinia, Tasmania

Discovery Bay to Piccaninnie Ponds IBA

This IBA extends along the coast from Green Point in South Australia to eastern Bridgewater Bay in Victoria which is dominated by coastal scrub. It includes long stretches of exposed sandy beaches and sand dunes as well as the Glenelg Estuary and other freshwater swamps. The IBA provides non-breeding habitat for the critically endangered orange-bellied parrot, breeding habitat for the endangered Australasian bittern, and supports populations of the near threatened hooded plover (Birdlife International 2023). Additional species that utilise the IBA include the sanderling, little tern and the fairy tern.I

Lawrence Rocks IBA

This IBA includes the entire terrestrial land area of Lawrence Rocks Wildlife Reserve (approximately 8.3 ha) which consists of two small islets that lie about 2 km offshore of Point Danger and 6 km south-east of Portland. Habitat on the islets consists of exposed rock and some patches of exotic grasses and native and exotic herbs. The IBA contains >10% of the global population of the Australasian gannet and is a likely breeding location for the little penguin, cape gannet, black-faced cormorant, crested tern and the silver gull (Birdlife International 2023).

Port Fairy to Warrnambool IBA

The IBA includes 17 km of beach and associated coastal dune scrub between Port Fairy and Warrnambool in western Victoria. Prominent vegetation within the area includes dense coastal dune scrub and a mosaic of aquatic herb lands, coastal saltmarsh and damp saline pasture. The IBA regularly supports a non-breeding population of the critically endangered orange-bellied parrot and a breeding population of the near threatened hooded plover (Birdlife International 2023). **Otway Range IBA** The IBA is consistent with Great Otway National Park which is approximately 150 km south-west of Melbourne. The coastline associated with this National Park runs between Torquay and Princetown with vegetation consisting of closed tussock grasslands and wind-pruned shrublands. Fifty-nine rare or threatened bird species have been recorded from Great Otway National Park, including five species listed at national level (shy albatross, wandering albatross, swift parrot, southern giant-petrel and fairy prion) and at least eighteen species listed under international treaties (Birdlife International 2023). **King Island IBA** The IBA includes: the entire coastline of King Island, which supports significant numbers of hooded plovers; Lavinia State Reserve, which supports the critically endangered orange-bellied parrot and endemic subspecies of bush birds; and three inshore islands which support large numbers of nesting seabirds. These islands are Christmas Island (a 63 ha Nature Reserve), New Year Island (a 98 ha Game Reserve, on which harvesting of shearwaters is allowed) and Councillor Island (11 ha of Crown Land). The coastline is a mixture of rocky outcrops and long sandy beaches with beach-washed kelp. The IBA is defined as the coastal strip extending from the low water mark to 1 km inland of the high-water mark around the entire island; this is intended to capture most significant habitat for shorebirds and orange-bellied parrots. **Albatross Island & Black Pyramid Rock IBA** The IBA includes of two islands offshore of north-west Tasmania which include Albatross Island (33 ha) and Black Pyramid Rock (40 ha). The coastline of Albatross Island is rocky and consists of eroded boulders, gulches and caves while the interior is composed of grasses and herbs. Black Pyramid Rock is a basaltic rock which is sparsely vegetated and surrounded by cliffs, grassy slopes and a central plateau. The IBA contains approximately 40% of the global population of the shy albatross and approximately 20% of the global population of the Australasian gannet (Birdlife International 2023). Additional species that utilise the IBA include the fairy prion, common-diving petrel, little penguin, short-tailed shearwater and the pacific and silver gull.

Potential consequence from an MDO spill		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Seabirds Most of the seabird species described in Section 4.6.7 that may occur in the spill EMBA forage over an extensive area and are distributed over a wide geographic range. Seabirds plunge diving through the sea surface for prey are most likely to encounter the low concentration of hydrocarbons due to its broader extent compared to moderate and high concentrations. Seabirds rafting, resting, diving or feeding at sea have the potential to come into contact with oil. Low threshold	**Seabirds** The zones of dissolved hydrocarbons meeting the moderate threshold and entrained hydrocarbons meeting the high threshold during an MDO spill are relatively small in comparison to the Bass Strait and Otway region. It is these small areas where sub-lethal or toxic effects to birds may occur. There is a low probability that seabirds would be feeding exclusively or predominantly on fish found in areas of higher hydrocarbon thresholds, meaning there is low probability of	**Seabirds** Most of the seabird species described in Section 4.6.7 that may occur in the spill EMBA forage over an extensive area and are distributed over a wide geographic range. Seabird interactions with shorelines is expected to occur largely during periods of rest and breeding activities. Species such as albatrosses and giant-petrels seldom come to land unless breeding. Resident seabirds are expected to spend greater periods of time on shorelines associated with burrows on sloping ground in coastal forest, scrubland, shrubland or grassland.

exposure is not expected to result in the lethal impacts of feather matting and hypothermia. High threshold exposure is expected to impart toxicity and ecological impacts. The extensive ocean foraging habitat available to Species such as albatross and petrel and the small area and temporary nature of the hydrocarbon release on the sea surface (<3 days) makes it unlikely that a spill will limit their ability to forage for unaffected prey, nor will the unlikely event of exposure at the sea surface result in permanent injury or mortality. Therefore, the consequence to seabirds is **Minor**. **Shorebirds** Due to the small area and temporary nature of the release and shorebird feeding habits and largely transitory presence in offshore environment, shorebirds are not expected to be exposed to surface (floating) MDO. Therefore, the consequence to shorebirds is **Minor**. **Aquatic Birds** As characteristic of aquatic birds, little penguin forage while swimming and often forage for extended periods of time (dawn to dusk) and may forage up to 50 km from the colony. As such little penguin are most at risk of direct contact, ingestion or inhalation while feeding at sea. Little penguins are most likely to encounter low concentrations of hydrocarbons due to its broader extent compared to moderate and high concentrations. The low threshold level of exposure is not expected to result in the lethal impacts of feather matting and hypothermia. The high threshold is	seabirds themselves experiencing sub-lethal or toxic impacts as a result of consuming hydrocarbon-tainted fish. Therefore, the consequence to seabirds is **Minor.** **Shorebirds** Due to the small area and temporary nature of the hydrocarbon release, and shorebird feeding habits being restricted to shorelines and their largely transitory presence in offshore environment, they are not expected to be exposed with in-water exposure. Therefore, the consequence to shorebirds is **Minor**. **Aquatic Birds** The zones of dissolved hydrocarbons meeting the moderate threshold and entrained hydrocarbons meeting the high threshold during an MDO spill are relatively small in comparison to the Bass Strait and Otway region. It is these small areas where sub-lethal or toxic effects may occur. There is a low probability that aquatic birds would be feeding exclusively or predominantly on fish found in areas of higher hydrocarbon thresholds, meaning there is low probability of aquatic birds themselves experiencing sub-lethal or toxic impacts as a result of consuming hydrocarbon-tainted fish. The proximity of the BIA on Christmas Island and foraging behaviours involving extended periods of time at sea, means that the potential direct exposure of these birds to MDO is greater than for other species. Therefore, the consequence to aquatic birds is **Moderate.**	There is predicted exposure at the high threshold for shoreline loading at King Island (1%), and shoreline loading at the low exposure threshold is unlikely to result in ecological impacts. However, coastlines potentially exposed to moderate threshold shoreline loading include King Island (26%), Moyne (23%), Corangamite (7%), Glenleg (5%), Warrnambool (4%), Lady Julia Percy Island (3%), Colac Otway (3%), Norman Island (1%), Lawrence Rocks (1%), South Gippsland (1%), Phillip Island (1%), Glennie Group (1%), Anser Island (1%), Kanowna Island (1%) and Skull Rock (1%). Short-tailed shearwater breeding BIA at Wilsons Promontory Islands (Vic), Christmas Island (Tas), Seal Rocks (Tas) and Badger Box Creek (Tas) (September to May) all occur within the moderate threshold shoreline loading. The common diving petrel breeding BIA at Lady Julia Percy Island (year-round) occurs within the moderate threshold shoreline loading. The black-faced cormorant breeding BIA at Christmas Island (Tas) occurs within the moderate threshold shoreline loading. However, given the small area of accumulation and exposure nature of these shorelines the consequence to seabirds is **Minor**. **Shorebirds** The shorebird species described in Section 4.6.7 are not likely to be exposed to moderate concentrations of hydrocarbons due to the small average length of shoreline (4.6 km) predicted to be exposed at this concentration. There is predicted exposure at the high threshold for shoreline loading at King Island (1%) and shoreline loading at the low exposure threshold is unlikely to result in ecological impacts. Shorebird species (e.g., plovers, godwits, curlews, etc.) prefer varying habitats including tidal flats, open saltmarsh, freshwater wetlands, open grasslands and sandy beaches. Many of these habitats are not largely contacted by moderate threshold hydrocarbons. Rather, coastlines potentially exposed to moderate threshold shoreline loading

expected to impart toxicity and ecological impacts. Given the offshore location of the spill, the small area and temporary nature of the hydrocarbon release on the sea surface (<3 days) it is unlikely that a spill will limit their ability to forage for unaffected prey, nor will the unlikely event of exposure at the sea surface result in permanent injury or mortality. Therefore, the consequence to seabirds is **Minor**.		are typically dominated by rock and interspaced by sections of sandy beach. These coastline features are prominent on the coast of Portland, on the coast between Warrnambool and Cape Otway, the south west and south east coast of King Island and on islands off the west coast of Wilsons Promontory. The Port Fairy to Warrnambool coastline is a recognised IBA which supports a breeding population of hooded plovers and is an over wintering site for the orange-bellied parrot. The King Island coastline is a recognised IBA which supports hooded plovers and includes Lavinia State Reserve (not intersected by shoreline loading), which supports orange-bellied parrots and endemic subspecies of bush birds. Other IBAs with the potential to be intersected by moderate shoreline loading include Lawrence Rocks and the Otway Range. Both IBAs support a variety of EPBC listed shorebird species. Due to the proximity of these IBAs and habitat for the orange-bellied parrot, and isolated areas of potential moderate shoreline loading on the IBA, the consequence of an MDO spill to shorebird species is **Moderate**. **Aquatic Birds** Little penguins are largely sedentary, returning to the colony when not at sea, with multiple breeding BIAs identified throughout the Bass Strait. These habitats are largely not contacted by the moderate threshold hydrocarbons. Rather, coastlines potentially exposed to moderate threshold shoreline loading are dominated by rock and interspaced by sections of sandy beach. These coastline features are prominent on the coast of Portland, on the coast between Warrnambool and Cape Otway, the south west and south east coast of King Island and on islands off the west coast of Wilsons Promontory. The King Island coastline is a recognised IBA which includes a breeding BIA at Christmas Island which occurs within the moderated threshold shoreline loading.

		Due to the proximity of the BIA on Christmas Island and isolated areas of potential moderate shoreline loading, the consequence of an MDO spill to aquatic bird species is **Moderate**.

Summary of predicted impact level to birds	**Risk rating**

An MDO release has the potential to result in:
• Change in fauna behaviour
• Injury/mortality to fauna
The extent of the area of impact is predicted to be limited to moderate threshold of surface (floating) hydrocarbon and in-water exposure in the upper water column (0-10 m depth). The worst-case consequence of an MDO release on injury/mortality or change in behaviour for birds has been assessed as **Moderate (3)** (for shorebirds and aquatic birds), based on:
• Risk of direct contact, ingestion or inhalation amongst bird species is largely determined by behaviours and habitat preferences. With those at greatest risk displaying behaviours and characteristics causing greater opportunity for exposure, including:
  o Proportion of the time spent at the sea surface, increasing the opportunity for direct exposure, inhalation or ingestion (i.e. Seabird species that raft together in large flocks and plunge dive, and aquatic birds which forage at sea for extended periods of time)
  o Occurrence of biologically important behaviours (i.e. breeding or feeding may override any tendency to avoid hydrocarbons)
  o Species feeding habits (i.e. seabird plunge diving, aquatic bird in-water feeding, shorebird intertidal foraging)
  o Breeding locations (i.e. preference for nest location in low lying coastal area)
• Flying birds are highly mobile and able to avoid noxious presence of hydrocarbons, as such general it is very unlikely to be constantly exposed to concentrations of hydrocarbons that would lead to chronic toxicity effects. Aquatic birds, though also highly mobile, are less able to avoid in-water exposures.
• Breeding colonies on low lying coastal areas (i.e. aquatic birds, shorebirds and seabirds) are likely to have greater exposure and sensitivity to hydrocarbon spills. For example, eggs may be tainted if a contaminated adult sits on the nest. However, given the volatile nature of MDO it is expected to weather rapidly.
• Port Phillip Bay (Western Shoreline) and Bellarine Peninsula, Western Port, Lavinia, Piccaninnie Ponds Karst and Glenleg Estuary and Discovery Bay listed RAMSAR wetlands are exposed to hydrocarbon however only at low threshold for entrained (in-water) MDO. The low exposure threshold is unlikely to result in ecological impacts to habitat function and in turn no ecological impacts to RAMSAR Listed Shorebirds.
• King Island (recognised IBA) has predicted shoreline accumulation of weathered MDO at the moderate threshold with a predicted maximum length of 13.4 km of shoreline affected with a 26% probability.
• Lawrence Rocks (recognised IBA) has predicted shoreline accumulation of weathered MDO at the moderate threshold with a predicted maximum length of 1 km of shoreline affected with a 1% probability.
• The coastline between Port Fairy and Warrnambool (recognised IBA) is located within the local government area of Moyne. Moyne has predicted shoreline accumulation of weathered MDO at the moderate threshold over a maximum length of 10.5 km of shoreline affected with a 23% probability.
	Seabirds
	Low
	(RR I)
	
	Shorebirds
	Medium
	(RR II)
	
	Aquatic Birds
	Medium
	(RR II)

• The coastline of the Otway Range (recognised IBA) is located across the local government areas of Corangamite, Colac Otway and the Surf Coast. Corangamite and the Colac Otway both have predicted shoreline accumulation of weathered MDO at the moderate threshold over a maximum length of 5.7 km and 9.6 km of shoreline affected with a 7% and 3% probability, respectively.
• Preening behaviours of birds also presents increased risk of ingested when exposed to MDO at sea (i.e. seabirds and aquatic birds).
• Listed Critical Habitat at Albatross Island (Tasmania) occurs within the low threshold for entrained exposure. The island represents one of four major breeding locations under Australian jurisdiction for shy albatross, wandering albatross and grey-headed albatross species.
• Marine pollution/oil spill is identified as a key threat in Recovery Plans for species present in the EMBA including:
  ○ Conservation Advice *Sternula nereis nereis* (Fairy Tern) identifies environmental pollution as a potential threat, particularly in Victoria where the close proximity of oil facilities poses a risk of oil spills that may affect the species' breeding habitat. Subspecies breeds in October to February in Australia. Moderate exposure threshold for MDO spill scenario does not overlap with Fairy Tern breeding BIAs, however Conservation Advice identified the following location as having notable occurrence within Victoria Corangamite; East Gippsland; West Gippsland; and Port Phillip and Western Port.
  ○ Conservation advice *Calidris canutus* (Red Knot) identifies environmental pollution as a potential threat due to potential impacts on habitat loss and habitat degradation. Oil spills are identified as a source of direct morality, with pollution/contamination identified as a having potential to adversely affected migratory shorebirds, both on passage and in non-breeding areas.
  ○ Conservation Advice *Calidris ferruginea* (Curlew Sandpiper) identifies environmental pollution as a potential threat due to potential impacts on habitat loss and habitat degradation, of particular concern around settled areas which may have reduced the availability of food, and at migratory staging sites. The key staging site for this occurs outside of the EMBA.
  ○ Conservation Advice for *Numenius madagascariensis* (Eastern Curlew) identifies environmental pollution as a potential threat to due to potential impacts on habitat loss and habitat degradation, of particular concern around settled areas which may have reduced availability of food, along migratory routes. Migratory arrivals are expected in southern Tasmania mostly around late August to early October with later arrivals, probably of juveniles, not until December.
  ○ Conservation Advice *Thinornis rubricollis rubricollis* (hooded plover eastern) identifies oil spill as a potential threat.
  ○ Wildlife Conservation Plan for Seabirds identifies acute pollution such as oil spill as a direct and moderate threat to seabirds.
  ○ Gould's Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan refers to oil spills, stating that oceanic oil spills may pose some risk given oceanic feeding habits.
  ○ National Recovery Plan for albatross and petrels (2022) identifies marine pollution as a potential threat to long term survival.
  ○ Wildlife Conservation Plan for Migratory Shorebirds identifies acute pollution such as oil spill is as a moderate threat due to potential impact on important habitat for many years through catastrophic loss of marine benthic food sources.
• The presence of species identified with BIAs overlapping the EMBA is expected to be largely transitory or short term in nature. Seabird BIAs which intersect the EMBA are discussed in 4.6.7 and presented in Table 4-10. Listed critical habitat occurs for wandering albatross and shy albatross at Albatross Island, which represents a major breeding habitat for this species. However, contact at low threshold only for entrained MDO exposure is expected (13%).
• An MDO release is considered to result in short-term and localised impacts, representing a small portion of the bird population that is widely representative of the region, with no population level impact expected.	

• Conservation values of protected areas associated with seabirds are not expected to be affected by an MDO release, including at: the Apollo AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision resulting in MDO release is very low. If an incident occurred, impacts would largely be restricted to upper water column and coastal areas and are expected to be restricted to individual fauna and unlikely to impede the recovery of a protected species or any associated food chains within the South-East bioregion.	

Table 7-22: Potential risk of MDO release on marine mammals

General sensitivity to oiling – marine mammals	
Sensitivity rating for cetaceans	**Medium-High**
Sensitivity rating for pinnipeds	**High**
A description of marine mammals in the EMBA is provided in:	Section 4.6.9
Cetaceans Cetaceans can be exposed to the chemicals in oil through: • Internal exposure by consuming oil or contaminated prey • Inhaling volatile oil compounds when surfacing to breathe • Dermal contact, by swimming in oil and having oil directly on the skin and body (NRDA 2012; Hook *et al*. 2016). The effects of this exposure include: • Maternal transfer of contaminants to embryos • Hypothermia due to conductance changes in skin, resulting in metabolic shock (expected to be more problematic for non-cetaceans in colder waters) • Toxic effects and secondary organ dysfunction due to ingestion of oil • Congested lungs • Damaged airways • Interstitial emphysema due to inhalation of oil droplets and vapour • Gastrointestinal ulceration and haemorrhaging due to ingestion of oil during grooming and feeding • Eye and skin lesions from continuous exposure to oil • Decreased body mass due to restricted diet, and • Stress due to oil exposure and behavioural changes. French-McCay (2009) identifies that a 10–25 µm oil thickness threshold has the potential to impart a lethal dose on marine species, however, also estimates a probability of 0.1% mortality to cetaceans if they encounter these thresholds based on the proportion of the time spent at surface. Direct surface oil contact with	

hydrocarbons is considered to have little deleterious effect on whales, possibly due to the skin's effectiveness as a barrier to toxicity, as such effect of oil on cetacean skin is probably minor and temporary (Geraci & St Aubin 1988). Cetaceans in particular have mostly smooth skins with limited areas of pelage (hair covered skin) or rough surfaces such as barnacled skin. Oil tends to adhere to rough surfaces, hair or calluses of animals, so contact with hydrocarbons by cetaceans is expected to cause only minor hydrocarbon adherence.

The physical impacts from ingested hydrocarbon with subsequent lethal or sub-lethal impacts are both applicable to entrained oil. However, the susceptibility of cetaceans varies with feeding habits. Baleen whales (such as blue, southern right and humpback whales) are not particularly susceptible to ingestion of oil in the water column but are susceptible to oil at the sea surface as they feed by skimming the surface. Oil may stick to the baleen while they 'filter feed' near slicks. Sticky, tar-like residues are particularly likely to foul the baleen plates.

The inhalation of oil droplets, vapours and fumes is a distinct possibility if whales surface in slicks to breathe. Exposure to hydrocarbons in this way could damage mucous membranes, damage airways or even cause death.

Toothed whales and dolphins may be susceptible to ingestion of dissolved and entrained oil as they gulp feed at depth. There are reports of declines in the health of individual pods of killer whales (a toothed whale species), though not the population as a whole, in Prince William Sound after the Exxon Valdez vessel spill (heavy oil) (Hook *et al*. 2016).

It has been stated that pelagic species will avoid hydrocarbon, mainly because of its noxious odours, but this has not been proven. The strong attraction to specific areas for breeding or feeding (e.g., use of the Warrnambool coastline as a nursery area for southern right whales) may override any tendency for cetaceans to avoid the noxious presence of hydrocarbons. So weathered or tar-like oil residues can still present a problem by fouling baleen whales feeding systems.

Dolphin populations from Barataria Bay, Louisiana, USA, which were exposed to prolonged and continuous oiling from the Macondo oil spill in 2010, had higher incidences of lung and kidney disease than those in the other urbanised environments (Hook *et al*. 2016). The spill may have also contributed to unusually high perinatal mortality in bottlenose dolphins (Hook *et al*. 2016).

As highly mobile species, in general it is very unlikely that cetaceans will be constantly exposed to concentrations of hydrocarbons in the water column for continuous durations (e.g., >96 hours) that would lead to chronic toxicity effects.

Pygmy blue whale (EPBC Act Endangered, Migratory): Pygmy Blue Whale foraging area (annual high use) BIA, known foraging area BIA and distribution BIA overlap low in-water thresholds and moderate in-water thresholds.

Southern right whale (EPBC Act Endangered, Migratory): SRW migration BIA and reproduction BIA overlap moderate in-water threshold (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467). The species are regularly present on the Australian coast between early-April to early November with isolated individuals seen outside these periods (DSEWPaC 2012c). Note the eastern population is recovering at a slower rate to the western population and, although both populations show signs of increase in abundance, current abundance levels remain very low compared to pre-exploitation numbers (Carroll et al. 2014, Stamation et al. 2020). Less than 10% of the Australian SRWs are distributed east of Adelaide (in eastern SA, TAS, Vic and NSW) and may represent a separate population.

Sei whale (EPBC Act Vulnerable, Migratory): No BIAs overlap MDO release thresholds. This species is infrequently recorded off Tasmania and offshore of the continental shelf in the Bonney upwelling (Gill et al. 2015; TSSC 2015e), with no known mating or calving areas in Australian waters (TSSC 2015e).

Fin whale (EPBC Act Vulnerable, Migratory): No BIAs overlap MDO release thresholds. The species is known to feed in the Bonney Upwelling during summer/autumn (DAWE, 2020d). Areas of upwelling and interfaces with mixed and stratified waters may be an important feature of fin whale feeding habitat.

Humpback whale (EPBC Act Migratory): Low exposure threshold overlaps humpback whale migration BIA. The nearest area that humpback whales are known to congregate and potentially forage is approximately 630 km north-east of the operational area at Twofold Bay, Eden off the New South Wales south coast. However, humpback whales are reported to migrate through Tasmanian waters. A study conducted by Andrews-Goff et al (2018) highlights the unlikeliness of the western coast of Tasmania and western Bass Strait to be frequently utilised for humpback whale migration.

Indian Ocean bottlenose dolphin: Low exposure threshold overlaps the Indian Ocean bottlenose dolphin breeding BIA which is located throughout the state waters of the East Marine Region within the 20 m contour.

Pinnipeds: Pinnipeds are vulnerable to sea surface exposures given they spend much of their time on or near the surface of the water as they need to surface every few minutes to breathe and regularly haul out on to beaches. Pinnipeds are also sensitive as they will stay near established colonies and haul-out areas, meaning they are less likely to practice avoidance behaviours. This is corroborated by Geraci and St. Aubins (1988) who suggest seals, sea- lions and fur-seals have been observed swimming in oil slicks during a number of documented spills.

Exposure to surface oil can result in skin and eye irritations and disruptions to thermal regulation. As a result of exposure to surface oils, pinnipeds, with their relatively large, protruding eyes are particularly vulnerable to effects such as irritation to mucous membranes that surround the eyes and line the oral cavity, respiratory surfaces, and anal and urogenital orifices. Hook et al. (2016) reports that seals appear not to be very sensitive to contact with oil, but instead to the toxic impacts from the inhalation of volatile components.

For some pinnipeds, fur is an effective thermal barrier because it traps air and repels water. Petroleum stuck to fur reduces its insulative value by removing natural oils that waterproof the pelage. Consequently, the rate of heat transfer through fur seal pelts can double after oiling (Geraci & St. Aubin 1988), adding an energetic burden to the animal. Kooyman et al (1976) suggest that in fact, fouling of approximately one-third of the body surface resulted in 50% greater heat loss in fur-seals immersed in water at various temperatures. Fur-seals are particularly vulnerable due to the likelihood of oil adhering to fur. Heavy oil coating and tar deposits on fur-seals may result in reduced swimming ability and lack of mobility out of the water. Davis and Anderson (1976) observed two Gray Seal pups drowning, their “flippers stuck to the sides of their bodies such that they were unable to swim”.

However, pinnipeds other than fur-seals are less threatened by thermal effects of fouling, if at all. Oil has no effect on the relatively poor insulative capacity of sea-lion and bearded and ringed seal pelts; oiled Weddell seal samples show some increase in conductance (Oritsland 1975; Kooyman et al. 1976; 1977). ITOPF (2011a) documents impacts on species that rely on fur to regulate their body temperature (such as fur-seals), demonstrating these species are most vulnerable to oil as the animals may die from hypothermia or overheating, depending on the season, if the fur becomes matted with oil.

It is reported that most pinnipeds scratch themselves vigorously with their flippers and do not lick or groom themselves, so are less likely to ingest oil from skin surfaces (Geraci & St. Aubin 1988). However, mothers trying to clean an oiled pup may ingest oil. All pinnipeds examined to date have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt 1982; Addison and Brodie 1984; Addison *et al*. 1986).

Ingested hydrocarbons can irritate or destroy epithelial cells that line the stomach and intestine, thereby affecting motility, digestion and absorption. However, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt 1982; Addison & Brodie 1984; Addison et al. 1986). Geraci & St. Aubin (1988) suggest that a small phocid weighing 50 kg might have to ingest approximately 1 litre of oil to be at risk.

Volkman et al (1994) report that benzene and naphthalene ingested by seals is quickly absorbed into the blood through the gut, causing acute stress, with damage to the liver considered likely. If ingested in large volumes, hydrocarbons may not be completely metabolised, which may result in death.

Breeding colonies (used to birth and nurse until pups are weaned) are particularly sensitive to hydrocarbon spills (Higgins & Gass 1993). Pinnipeds also appear to rely on scent to establish a mother-pup bond (Sandegren 1970; Fogden 1971), and consequently oil-coated pups may not be recognisable to their mothers. This is only theorised, with studies and research indicating interaction between mothers and oiled pups were normal (Davis and Anderson 1976; Davies 1949; Shaughnessy & Chapman 1984). The long-term Environmental Impact and Recovery report for the Iron Barren oil spill (in Tasmania, 1995) concluded that “The number of seal pups born at Tenth Island in 1995 was reduced when compared to previous years. There was a strong relationship between the productivity of the seal colonies and the proximity of the islands to the oil spill wherein the islands close to the spill showed reduced pup production and those islands more distant to the oil spill did not” (Tasmanian SMPC 1999). Australian sea-lions have ‘naturally poor recovery abilities’ due to ‘unusual reproductive biology and life history’ (TSSC 2005). Due to the extreme philopatry of females and limited dispersal of males between breeding colonies, the removal of only a few individuals annually may increase the likelihood of decline and potentially lead to the extinction of some of the smaller colonies. Extinction of breeding colonies has the potential to further reduce genetic diversity and the already limited genetic flow between colonies. This, in turn, may weaken the genetic resilience of the species and impact on its ability to cope with other natural or anthropogenic impacts. In addition, the extreme philopatry of females suggests that extinction of breeding colonies may lead to a contraction of the range of the species as re-colonisation of breeding sites via immigration is limited. For the reasons outlined above, small breeding colonies are under particular pressure of survival from even low levels of anthropogenic mortality. **Australian sea-lion (EPBC Act Endangered, Marine):** Low exposure threshold overlaps the Australian sea-lion (male) foraging BIA which is located within the Great Australian Bight, Eyre Peninsula, Spencer Gulf, Investigator Passage, Gulf of St Vincent and Kangaroo Island. Only males are known to forage this far from colonies.		
Potential consequence from an MDO spill		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Cetaceans Spill modelling predicts that low, moderate and high zones of exposure to sea surface hydrocarbon will overlap the foraging BIA for pygmy blue whales (PBW). It is possible that PBW may be present in the EMBA. If present, these species (and other cetaceans) may be exposed to oil in the manner described below. If large quantities of zooplankton exposed to the spill were ingested, chronic toxicity impacts may occur. Biological consequences of physical contact with localised areas of low concentrations of hydrocarbons at the sea surface are unlikely to lead to any long-term population impacts, with temporary skin irritation and very light fouling/matting of baleen plates likely to occur. However, given that southern right	**Cetaceans** Stochastic spill modelling shows the EMBA for dissolved and entrained hydrocarbons at the low threshold through Bass Strait and the Otway region. At the low threshold, water quality triggers may be exceeded, but there are no toxicity or ecological effects to cetaceans. The maximum distance (km) from release location of dissolved hydrocarbons at moderate threshold is 24 km, and of entrained hydrocarbons at high threshold is 206 km. It is unlikely that highly mobile and transient species such as cetaceans moving through deep water, through a geographically and temporally limited area of entrained or dissolved hydrocarbons at moderate or high exposure, would	**Cetaceans** Given cetaceans marine existence, shoreline hydrocarbons are not applicable. **Pinnipeds** Exposure to weathered hydrocarbons at the low threshold is unlikely to have a biological or ecological impact. Moderate threshold hydrocarbons may contact shorelines used by fur-seals at

whales are expected to be present periodically and given the particular sensitivities of baleen whales to oil spills, the consequence to cetacean populations from MDO at the sea surface while migrating or foraging in the EMBA at the time of the spill, is **Moderate**. **Pinnipeds** The foraging range for New Zealand Fur-seals, Australian Sea-lions and Australian Fur-seals may be temporarily exposed to low, moderate and high concentration of hydrocarbons at the sea surface. As fur-seals forage for prey within the water column rather than at the sea surface, exposure to oil at the sea surface will only result when surfacing to breathe and resting at the surface. Moderate and high concentrations do not reach shorelines where seals are likely to be entering and exiting the water. Depending on the duration of time spent at the sea surface, exposure may result in irritation to mucous membranes that surround the eyes and line the oral cavity, respiratory surfaces, and anal and urogenital orifices. Given the very small area of MDO at moderate and high exposure levels on the sea surface predicted from a single spill, as well as the rapid evaporation from the sea surface (days), acute or chronic toxicity impacts are not likely for multiple individuals. The highly mobile nature of pinnipeds means areas on the sea surface impacted by moderate and high hydrocarbon exposure can be avoided. Given that no breeding or haul out areas occur within the sea surface exposure areas and given the rapid weathering of MDO, the consequence of sea surface MDO to multiple individuals and populations present in Bass Strait is **Minor**.	experience any toxicity effects and population level impacts would be unlikely. The well-mixed waters of central Bass Strait are likely to assist in weathering of hydrocarbons (RPS 2023). The oceanographic conditions, light nature of the hydrocarbon and low concentrations in the water column means the consequence to cetacean populations from an MDO spill is **Minor**. **Pinnipeds** Given that fur-seals forage for prey within the water column, exposure to hydrocarbons (either via ingestion of contaminated prey or direct contact with oil droplets) may occur. However, the low concentrations modelled are below those likely to impart permanent injury or mortality to pinniped populations. The predicted zones of dissolved hydrocarbons meeting the moderate threshold and entrained hydrocarbons meeting the high threshold are small in comparison to the wider area available to pinnipeds for foraging. However, modelling indicates that known Australian fur-seal haul-out sites, Cape Bridgewater (Vic) (Kirkwood et al. 2010) and breeding sites, Lady Julia Percy Island (Vic), Reid Rocks (Tas) (Kirkwood et al. 2010) overlap with areas of entrained high threshold. Note however, these sites are not recognised as BIAs within the National Conservation Atlas Tool. The presence of a haul-out or breeding site means that it is likely that pinnipeds would be feeding on prey found in the areas of higher hydrocarbon thresholds for longer periods of time. The area potentially affected by hydrocarbons represents a relatively small area in which fur seals are known to forage in Bass Strait and the Otway region. Because of this, the consequence to fur seals from an MDO spill is **Minor**.	Lady Julia Percy Island, the south coast of King Island and off the west coast of Wilsons Promontory. Contact is expected at one known breeding location in the region, Lady Julia Percy Island and at no known haul out sites within the region. Given the brief time that MDO will remain at the moderate threshold and its limited extent, the consequence of an MDO spill to multiple individuals and populations present in Bass Strait is **Minor**.

Summary of predicted impact level to marine mammals	**Risk rating**
An MDO release the potential to result in: • Change in fauna behaviour	**<u>Cetaceans</u>** **Medium**

• Injury/mortality to fauna The extent of the area of impact is predicted to be limited to moderate thresholds of surface (floating) and in-water hydrocarbons in the upper water column (0-10 m depth). The worst-case consequence of MDO release on injury/mortality or change in behaviour has been assessed as **Moderate (3)** for cetaceans and **Minor (2)** for pinnipeds, based on:	**(RR II)**

• The risk of direct contact, ingestion or inhalation amongst marine mammal species is largely determined by behaviours and habitat preferences. With those at greatest risk displaying behaviours and characteristics causing greater opportunity for exposure, including:
  ○ Availability of rough surface for oil to adhere to (i.e. pinnipeds more susceptible than cetaceans)
  ○ Proportion of the time spent at the sea surface, creating increase opportunity for direct exposure, inhalation or ingestion (i.e. pinnipeds more susceptible than cetaceans due to inhalation requirements and resting (haul out) and breeding behaviours)
  ○ Occurrence of biologically important behaviours (i.e. breeding or feeding may override any tendency for marine mammals to avoid hydrocarbons)
  ○ Species feeding habits (i.e. baleen whales are not particularly susceptible to ingestion of oil in the water column, but are more susceptible to oil at the sea surface as they feed by skimming the surface)
• Marine mammals are highly mobile and able to avoid noxious presence of hydrocarbons, as such generally it is very unlikely for marine mammals to be exposed to concentrations of hydrocarbons for a duration that would lead to chronic toxicity effects.
• Pinniped breeding colonies are likely to have greater exposure and sensitivity to hydrocarbon spills. Hydrocarbon contaminated pups may not be recognisable to their mothers and present an increased risk that mothers may ingest oil when cleaning oiled pups.
• Marine pollution/habitat impacts are identified as key threats in Recovery Plans for species present in the EMBA including:
  ○ Conservation Management Plan for the Blue Whale identifies habitat modification as a threat, with no explicit relevant objectives or management actions.
  ○ Conservation Management Plan for the Southern Right Whale identifies habitat modification as a threat, with no explicit relevant objectives or management actions.
  ○ Conservation advice for *Balaenoptera borealis* (Sei Whale) identifies habitat degradation including pollution as a threat, with no explicit relevant objectives or management actions.
  ○ Conservation advice for *Balaenoptera physalus* (Fin Whale) identifies pollution (persistent toxic pollutants) as a threat, with no explicit relevant objectives or management actions.
  ○ Approved Conservation Advice for *Megaptera novaeangliae* (Humpback Whale) identifies habitat degradation including coastal development and port expansion as a threat, with no explicit relevant objectives or management actions.
  ○ Conservation Advice for *Neophoca cinerea* (Australian sea lion) identifies habitat degradation and pollution from oil spills as a threat and prioritises all vessels to have oil spill mitigation measures in place.
• South-east Commonwealth Marine Reserves Network management plan 2013-23 identifies oil pollution associated with shipping, other vessels and offshore mining operations as a pressure on conservation values of the South-east to the Commonwealth Marine Reserves Network, however, provides no explicit relevant objectives or management actions.
• The presence of species identified with BIAs overlapping the EMBA is expected to be largely transitory or short term in nature. BIAs for the following intersect with the moderate in-water threshold:
  ○ PBW distribution:
	<u>Pinnipeds</u>
	Low
	(RR I)

- High use foraging BIA represents seasonally high usage occurring between Cape Otway and Robe, in conjunction with seasonal Bonney Upwelling in summer/autumn months. - Foraging BIA represents a known foraging area which occurs north-west part of Bass Strait, from Cape Otway to Port Phillip Heads and to the south of King Island and extends to the majority of Bass Strait and the coastal waters of Tasmania. - Distribution BIA represent seasonally high usage of a large area that extends from southern NSW to Indonesia along whale seasonal migratory route. o Southern Right Whale (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467) - Migration BIA represents open ocean and coastal waters around Tasmania, across the Bass Strait and west across Australia's southern coastline between April to October. - Reproduction BIA represents shallow coastal waters around Tasmania, the entire Victorian coastline, the southern NSW coastline between May to September. • An MDO release is considered to result in short-term and localised impacts at an individual level, with no population level impact expected. • Conservation values of protected areas associated with cetaceans are not expected to be affected by an MDO release, including at: the Apollo AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision resulting in MDO release is very low. If an incident occurred, it impacts would largely be restricted to upper water column and coastal areas, and are expected to be restricted to individual fauna and unlikely to impede the recovery of a protected species.	

Table 7-23: Potential risk of MDO release on marine reptiles

General sensitivity to oiling – marine reptiles	
Sensitivity rating of marine reptiles	**Medium**
A description of marine reptiles in the EMBA is provided in:	Section 4.6.8
Sea turtles are vulnerable to the effects of oil at all life stages—eggs, post-hatchlings, juveniles, and adults in nearshore waters. Several aspects of sea turtle biology and behaviour place them at particular risk, including a lack of avoidance behaviour, indiscriminate feeding in convergence zones, and large pre-dive inhalations. Effects of oil on turtles include increased egg mortality and developmental defects, direct mortality due to oiling in hatchlings, juveniles and adults; and negative impacts to the skin, blood, digestive and immune systems and salt glands. Oil exposure affects different turtle life stages in different ways. Thus, information on oil toxicity needs to be organised by life stage. Turtles may be exposed to chemicals in oil in two ways: • Internally – eating or swallowing oil, consuming prey containing oil-based chemicals, or inhaling of volatile oil related compounds; and • Externally – swimming in oil or dispersants, or oil or dispersants on skin and body. Records of oiled wildlife during spills rarely include marine turtles, even from areas where they are known to be relatively abundant (Short 2011). An exception to this was the large number of marine turtles collected (613 dead and 536 live) during the Macondo spill in the Gulf of Mexico, although many of these animals did not show any sign of oil exposure (NOAA 2013). Of the dead turtles found, 3.4% were visibly oiled and 85% of the live turtles found were oiled (NOAA 2013). Of the captured animals, 88% of the live turtles were later released, suggesting that oiling does not inevitably lead to mortality. There is potential for contamination of turtle eggs to result in similar toxic impacts to developing embryos as has been observed in birds. Studies on freshwater snapping turtles showed uptake of PAHs from contaminated nest sediments, but no impacts on hatching success or juvenile health following exposure of eggs to dispersed weathered light crude (Rowe *et al*. 2009). However, other studies found evidence that exposure of freshwater turtle embryos to PAHs results in deformities (Bell *et al*. 2006, Van Meter *et al*. 2006). Turtles may experience oiling impacts on nesting beaches and eggs through chemical exposure, resulting in decreased survival to hatching and developmental defects in hatchlings. Turtle hatchlings may be more vulnerable to smothering as they emerge from the nests and make their way over the intertidal area to the open water (AMSA 2015). Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects including impaired movement and bodily functions (Shigenaka 2003). Hatchlings sticky with oily residues may also have more difficulty crawling and swimming, rendering them more vulnerable to predation. Ingested oil may cause harm to the internal organs of turtles. Oil covering their bodies may interfere with breathing because they inhale large volumes of air to dive. Oil can enter cavities such as the eyes, nostrils, or mouth. Turtles may experience oiling impacts on nesting beaches when they come ashore to lay their eggs, and their eggs may be exposed during incubation, potentially resulting in increased egg mortality and/or possibly developmental defects in hatchlings. Note sea snakes have not been describe here as they are not expected to occur (Section 4.6.8), as such sensitivity of MDO release to sea snakes has not been assessed.	

Potential consequence from an MDO spill		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Some individual marine reptiles may come into contact with low, moderate and high hydrocarbon exposure on the sea surface during transitory behaviours in the Bass Strait. Turtle interaction with floating oil is expected to include direct contact due to resting behaviours, floating on the sea surface, and through inhalation of volatile compounds in the vicinity of unweathered MDO. At moderate and high concentrations, toxicity impacts may occur including sub-lethal irritation of skin or cavities. However, due to the absence of turtle BIAs and nesting locations in Bass Strait and the Otway region and the low number of turtles foraging or migrating through Bass Strait in general, the consequence of an MDO spill to threatened turtle individuals and populations is **minor**.	Some individual marine reptiles may come into contact with low, moderate and high hydrocarbon exposure in-water, while swimming or feeding. At the moderate and high concentrations, toxicity impacts may occur including sub-lethal irritation of skin or cavities. However, due to the absence of turtle BIAs and nesting locations in Bass Strait and the Otway region and the low number of turtles foraging or migrating through Bass Strait in general, the consequence of in-water MDO to threatened turtle individuals and populations is **minor**.	There are no turtle nesting sites on the southern Victorian coast, offshore islands or Tasmanian shorelines. Thus, the consequence of shoreline MDO to threatened turtle individuals and populations is **minor**.

Summary of predicted impact level to marine reptiles	Risk rating

An MDO release has the potential to result in:
• Change in fauna behaviour
• Injury/mortality to fauna
The extent of the area of impact is predicted to be limited to moderate threshold of surface (floating) and in-water hydrocarbon exposure in the upper water column (0-10 m depth). The consequence of MDO release on injury/mortality or change in behaviour has been assessed as **Minor (2)**, based on:
• Risk of direct contact, ingestion or inhalation amongst marine turtles is largely determined by behaviours and habitat preferences. With those at greatest risk displaying behaviours and characteristics causing greater opportunity for exposure including:
  ○ Proportion of the time spent at the sea surface, creating increased opportunity for direct exposure, inhalation or ingestion
  ○ Occurrence of biologically important behaviours, particularly where nesting location occur within the EMBA (i.e. breeding or feeding may override any tendency for to avoid hydrocarbons)
• Marine reptiles are highly mobile and able to avoid noxious presence of hydrocarbons, as such generally it is very unlikely for marine turtles to be exposed to concentrations of hydrocarbons for durations that would lead to chronic toxicity effects.
• There are no nesting or internesting areas identified as habitat critical to the survival of marine turtles in the waters of southern Australia, removing risk of impact to eggs and hatchlings which are most vulnerable to chronic toxicity effects in the event of a MDO release.
• The Recovery Plan for Marine Turtles in Australia identifies acute chemical discharge (including spills from vessels) as a threat to the long term survival of marine turtles. However, no marine turtle stock group is identified to overlap with the low threshold EMBA,
	Marine Reptiles
	Low
	(RR I)

suggesting turtle occurrence in the south-east is transitory. Action Area A4 identifies minimising chemical and terrestrial discharge, with relevant management actions including: o Ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g. nesting habitat, seagrass meadows or coral reefs. o Quantify the impacts of decreased water quality on stock viability. o Quantify the accumulation and effects of anthropogenic toxins in marine turtles, their foraging habitats and subsequent stock viability. • The presence of marine turtles identified via PMST overlapping the EMBA are expected to be largely transitory or short term in nature. No BIAs or habitat critical to the survival of the species were identified. • An MDO release is considered to result in short-term and localised impacts at an individual level, with no population level impact expected. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision resulting in MDO release is very low. If an incident occurred, the impacts would largely be restricted to the upper water column and restricted to an area of surface (floating) MDO at the moderate threshold, due to occurrence of water-soluble volatile MDO component. Impact is expected to be restricted to individual fauna and unlikely to impede the recovery of a protected species or any associated food chains within the South-East bioregion.	

Table 7-24: Potential risk of MDO release on commercial fisheries / other marine and coastal users

General sensitivity to oiling - commercial fisheries / other marine and coastal users	
Sensitivity rating for commercial fisheries (Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421)	**Medium**
Sensitivity rating for other marine and coastal users	**Medium**
Sensitivity rating for energy exploration and production	**Medium**
A description of commercial fisheries / other marine and coastal users in the EMBA is provided in:	Section 4.7

Commercial Fisheries

Commercial fishing has the potential to be impacted through exclusion zones associated with a spill, the spill response and subsequent reduction in fishing effort. Exclusion zones may impede access to commercial fishing areas, for a short period of time, and nets and lines may become oiled. The impacts to commercial fishing from a public perception, however, may be much more significant and longer term than the spill itself.

Fishing areas may be closed for fishing for shorter or longer periods because of the risks of the catch being tainted by oil. Concentrations of petroleum contaminants in fish and crustacean and mollusc tissues could pose a significant potential for adverse human health effects and, until products from affected fisheries have been cleared by health authorities, they could be restricted for sale and human consumption. Toxicity in adult fish has been reported in response to crude oils, HFO and diesel (Holdway 2002; Shigenaka 2011). Uptake of hydrocarbons has been demonstrated in bony fish after exposure to the water -soluble fraction of between 24 and 48 hours. Danion et al (2011) observed PAH uptake of 148 µg/kg-1 after 48-hour exposures to PAH from Arabian Crude at high concentrations of 770 ppm. Davis et al (2002) report detectable tainting of fish flesh after a 24-hour exposure at crude concentrations of 0.1 ppm, marine fuel oil concentrations of 0.33 ppm and diesel concentrations of 0.25 ppm. The majority of studies, either from laboratory trials or of fish collected after spill events (including the Hebei Spirit, Macondo, and Sea Empress spills) find evidence of elimination of PAHs in fish tissues returning to reference levels within two months of exposure (Challenger and Mauseth 2011; Davis et al. 2002; Gagnon & Rawson 2011; Gohlke et al. 2011; Jung 2011; Law 1997; Rawson et al. 2011)

Should there be impacts to fish stocks associated with impacts to plankton life phase there is the potential for reduction in profits for commercial fisheries over a longer period of time, and potential for reduced fishing quotas or exclusion zones, associated with sustainable fisheries management.

The Montara spill of a light gas condensate, (as the most recent [2009] example of a large hydrocarbon spill in Australian waters) occurred over an area fished by the Northern Demersal Scalefish Managed Fishery (with 11 licences held by 7 operators), with Goldband Snapper, Red Emperor, Saddletail Snapper and Yellow Spotted Rockcod being the key species fished (PTTEP 2013). As a precautionary measure, the WA Department of Fisheries advised the commercial fishing fleet to avoid fishing in oil-affected waters. Testing of fish caught in areas of visible oil slick (November 2009) found that there were no detectable petroleum hydrocarbons in fish muscle samples, suggesting fish were safe for human consumption. In the short-term, fish had metabolised petroleum hydrocarbons. Limited ill effects were detected in a small number of individual fish only (PTTEP 2013). No consistent effects of exposure on fish health could be detected within two weeks following the end of the well release. Follow up sampling in areas affected by the spill during 2010 and 2011 (PTTEP 2013) found negligible ongoing environmental impacts from the spill.

Similarly, the Macondo well blowout in the Gulf of Mexico (2010) began testing a month after the event showing levels of oil contamination residue in seafood consistently tested 100 to 1,000 times lower than safety thresholds established by the USA FDA, and every sample tested was found to be far below the FDA's safety threshold for dispersant compounds (BP 2015). FDA testing of oysters found oil contamination residues to be 10 to 100 times below safety thresholds (BP 2014). Sampling data shows that post-spill fish populations in the Gulf of Mexico since 2011 were generally consistent with pre-spill ranges and for many shellfish species, commercial landings in the Gulf of Mexico in 2011 were comparable to pre-spill levels. In 2012, shrimp (prawn) and blue crab landings were within 2.0% of 2007-09 landings.

In the event of a MDO spill, a temporary fisheries closure may be put in place by the VFA (or voluntarily by the fishers themselves). Oil may foul the hulls of fishing vessels and associated equipment, such as gill nets. A temporary fisheries closure, combined with oil tainting of target species (actual or perceived), may lead to financial losses to fisheries and economic losses for individual licence holders. Fisheries closures and the flow on losses from the lack of income derived from these fisheries are likely to have short-term but widespread socio-economic consequences, such as reduced employment in fisheries service industries, such as tackle and bait supplies, fuel, marine mechanical services, accommodation, etc.

Other Marine and Coastal Users Other marine and coastal users are expected to include commercial shipping, defence activities, other offshore energy industry, tourism and recreational users. Following an oil spill marine users are expected to be impacted largely by implementation of exclusion zones which may impede access to areas, for a short period of time. Marine users in the area may be impacted by oiled/contamination of equipment and assets. Notably there are several offshore energy development projects and onshore processing plants, including aquaculture facilities (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 285), within the region which require water intake for operation. In the event of a spill, it is understood that most seawater intakes are positioned subsurface and can be isolated to prevent contamination and equipment/stock damage resulting in project or production impacts. Tourism and recreational marine users, include recreational and charter fishing and other coastal activities (beach access, surfing etc.) are expected to be the most affected by an MDO release. However, given the offshore location and volatility of MDO, these impacts are reduced to largely perception issues associated with visible hydrocarbons reaching coast lines. Following the Macondo well blowout (2010) recreational fishing harvests in 2011, 2012 and 2013 were recorded to exceed landings from 2007-09, prior to the blowout (BP 2014), suggesting recovery of fish stocks and confidence in public perception of fish quality.		
Potential consequence from an MDO spill		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Commercial Fisheries A short-term (days to weeks) fishing exclusion zone may be implemented by AFMA or the Victorian or Tasmanian fishing authorities in the event of a spill. Given the temporary nature of any surface slick and the low fishing intensity in the EMBA, there are unlikely to be any significant impacts on fisheries in terms of lost catches (and associated income). However, additional expense to individual fishers where contamination of fishing gear has occurred can be expected, whereby oiled surfaces may themselves be a source of secondary contamination until they are cleaned. The consequence to commercial fisheries overall function or its target catch species in the long-term is **Minor**.	**Commercial Fisheries** A short-term (days to weeks) fishing exclusion zone may be implemented by AFMA or the Victorian or Tasmanian fishing authorities in the event of a spill. Areas of moderate dissolved and high entrained exposure thresholds are expected to be very small as MDO is predicted to weather quickly and the area would return to pre-spill conditions rapidly. MDO is not expected to accumulate among benthic sediments in the EMBA due to the significant mixing of waters and dilution of the low concentration of hydrocarbons in the water column, as such reducing impacts to habitats beyond 30 m depth, which are likely slower to recover. For most fisheries described in Section 4.7, precautionary exclusion from fishing grounds can be expected until water quality monitoring verifies the absence of residual hydrocarbons, providing confidence to consumers. The consequence to commercial fisheries operating in the offshore environment, where there are no expected impacts to overall function or target catch species in the long-term, is **Minor**. However, for fisheries operating inshore (<10 m depth) along coastal sections (depending on actual spill trajectory) the consequence is expected to be **Moderate**. Stochastic modelling indicates the maximum extent of low to high exposure of the benthic layer to entrained hydrocarbons (in 0-10 m water depths) occurs in the nearshore environment in southern South Australia, along the western and central	**Commercial Fisheries** Vessels use local ports, many of which are not included within the EMBA. Where the EMBA includes moored fishing vessels, some staining or coating of vessel hulls may occur. The consequence to commercial fisheries overall function or its target catch species in the long-term is **Minor**. **Other Marine and Coastal Users** Marine and coastal users most affected by shoreline accumulation of weathered MDO are recreational and charter fishers and those engaging in water sports (e.g.

Other Marine and Coastal Users Marine and coastal users most at risk of surface (floating) hydrocarbons are largely restricted to shallower coastal waters and shorelines. Exposure of coastal waters and shoreline to surface (floating) oil is only expected at low thresholds (Org ID: 593, Event ID: 3133, FB ID: 262). The consequence to other marine and coastal users is **Minor**. **Energy Exploration and Production** Energy exploration and production occurring in the Bass Strait are not anticipated to be significantly impacted by surface (floating) oil given intakes are typically located below sea surface to avoid intake of floating objects. The consequence energy exploration and production is **Minor,** given the offshore nature of the spill and anticipated rapid weathering of MDO.	Victorian coastline as well as the King Island coast. Impacts to fisheries in these areas may eventuate in the form of temporary and precautionary exclusions from fishing grounds until water quality monitoring verifies the absence of residual hydrocarbons. Extended exclusions zones maybe persist due to slower rate of degradation of entrained MDO components. Such fisheries may include Rock Lobster (Vic), Giant Crab (Tas), Southern Rock Lobster (Tas), depending on actual spill trajectory. **Other Marine and Coastal Users** Marine and coastal users most at risk of in-water hydrocarbons are largely restricted to shallower coastal waters. Exposure of coastal waters is expected at moderate thresholds, in the nearshore environment along coastline between the South Australia/Victoria border and Cape Otway as well as King Island coast (Org ID: 593, Event ID: 3133, FB ID: 262). Precautionary exclusion from these areas may be implemented by local governments until water quality monitoring verifies the absence of residual hydrocarbons. The consequence to other marine and coastal users is **Minor,** given the offshore nature of the spill and anticipated rapid weathering of MDO. **Energy Exploration and Production** Energy exploration and production occurring in the Bass Strait may be impacted by in-water hydrocarbons, given intakes are typically located below sea surface. Based on spill modelling, offshore nature of the spill and rapid weathering of MDO, any closure of water intakes is anticipated to be short term (days to weeks) with a consequence of **Minor**.	surfing, boating, diving) (Org ID: 593, Event ID: 3133, FB ID: 262). Modelling suggests that the average length of shoreline contact is 6.3 km at low (visible) threshold and 4.6 km at moderate (impact) threshold, with an 85% probability of contacting a shoreline above low threshold. The consequence to other marine and coastal users is **Minor,** given the likelihood of shoreline contact and anticipated rapid weathering of MDO. **Energy Exploration and Production** No impacts to energy exploration and production are expected as a result of shoreline accumulation of MDO.

Summary of predicted impact level to commercial fisheries / other marine and coastal users	**Risk rating**
An MDO release has the potential to result in: • Changes to the functions, interests or activities of other users • Change in aesthetic value The extent of the area of impact is predicted to be limited to locations where there is potential for marine and coastal user's equipment to come into contact with moderate threshold exposure or where activities are excluded from areas traditionally accessed. These are anticipated to be largely areas interacting with the upper water column (30 m depth) or where MDO is visible. The consequence of an MDO release on impacting individual marine and coastal users traditional behaviours has been assessed as **Moderate (3)**, based on: • Risk of marine and coastal users equipment being contaminated or traditional access to locations being excluded is largely determined by location and volume of MDO spill in relation to these activities and visual extent of the spill. • Exclusion zones from areas are expected to be short term (days to weeks) based on MDO weathering characteristics.	**Medium** **(RR II)**

• Precautionary exclusion from fishing grounds is expected to be based on water quality monitoring which verifies the absence of residual hydrocarbons, providing consumer confidence. • Impact to fish is expected to be short-term, given their ability to metabolise petroleum hydrocarbons. As such limited ill effects are expected in a small number of individual fish only, with tainting expected to return to reference levels within two months of exposure. • An MDO release is considered to result in short-term and localised impacts, representing individual marine and coastal users of a small area which is widely representative of the region, with no fishery level impacts expected resulting from MDO release. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision resulting in MDO release is very low. If an incident occurred, its impacts would largely be restricted to the upper water column in the immediate vicinity of the spill, coastal areas and shoreline experiencing low (visible) threshold hydrocarbons exposure (Org ID: 593, Event ID: 3133, FB ID: 262). Impact is expected to be restricted to individual marine and coastal users and unlikely to affect an entire fishery.	

Table 7-25: Potential risk of MDO release on coastal habitats and communities

General sensitivity to oiling - coastal habitats and communities	
Sensitivity rating for rocky shores, sandy beaches	**Low**
Sensitivity rating for other coastal habitats and communities	**Medium**
Sensitivity rating for First Nations heritage	**Medium**
Sensitivity rating for State Marine Protected Areas	**High**
A description of coastal habitats and communities in the EMBA is provided in:	Section 4.6.2
Sandy beaches Sandy beaches are regularly exposed to wave action and have low sediment total organic carbon and therefore generally a low abundance of marine life (Hook *et al*. 2016). The low concentration of total organic carbon and large particle size of sand means that any MDO deposited on the beach would not be retained. However, sandy beaches are important socio-economically, so an MDO spill reaching this type of shoreline may attract attention that is disproportionate to its sensitivity (Hook *et al*. 2016). Depth of penetration in sandy sediment is influenced by: • Particle size - penetration is great in coarser sediments (such as beach sand) compared to mud (in estuaries and tidal flats). • Oil viscosity – MDO quickly penetrates sandy sediments. • Drainage – coarse beach sands allow for rapid drainage (it may reach depths greater than one metre in coarse well-drained sediments). • Animal burrows and root pores – penetration into fine sediments is increased if there are burrows of animals such as worms, or pores left where plant roots have decayed.	

Areas of heavy oiling (>1,000 g/m^2 threshold) would likely result in acute toxicity and death of many invertebrate communities, especially where oil penetrates into sediments through animal burrows (IPIECA 1999). However, these communities would be likely to rapidly recover (recruitment from unaffected individuals and recruitment from nearby areas) as oil is removed from the environment. The results of exposure to oil may be acute (e.g., die off of amphipods and replacement by more tolerant species such as worms or chronic (i.e., gradual accumulation of oil and genetic damage) (Hook *et al*. 2016).

For example, following the Sea Empress crude oil spill (in west Wales, 1996) many amphipods (sandhoppers), cockles and razor shells were killed. There were mass strandings on many beaches of both intertidal species (such as cockles) and shallow sub-tidal species. Similar mass strandings occurred after the Amoco Cadiz spill (in Brittany, France, 1978) (IPIECA 1999). Following the Sea Empress spill, populations of mud snails recovered within a few months, but some amphipod populations had not returned to normal after one year. Opportunists such as some species of worm may actually show a dramatic short-term increase following an oil spill (IPIECA 1999). Long-term depletion of sediment fauna could have an adverse effect on birds or fish that use tidal flats as feeding grounds (IPIECA 1999).

In March 2014, small volumes of crude oil from an unidentified source (confirmed to not be offshore oil and gas production facilities) washed up along a 7 km section of sandy beach on the Victorian Gippsland coast as small (a few millimetres thick) granular balls (Gippsland Times 2014; ABC News 2014). AMSA (2014b) reported that no impacts were observed over the course of two months following the incident.

The Macondo well blowout resulted in crude oil washing up on sandy beaches of the Alabama coastline. The natural movement of sand and water through the beach system continually transformed and re-distributed oil within the beach system and, 18 months after the event, mobile remnant oil remained in various states of weathering buried at different depths in the beaches (Hayworth et al. 2011). Other results from beach sampling undertaken at Dauphin Island, Alabama, in May (pre-impact) and September 2011 (post-impact) found a large shift in the diversity and abundance of microbial species (e.g., nematodes, annelids, arthropods, polychaetes, protists, fungi, algae and bacteria). Post-spill, sampling indicated that species composition was almost exclusively dominated by a few species of fungi. DNA analyses revealed that the ‘before’ and ‘after’ communities at the same sites weren’t closely related to each other (Bik et al. 2012). Similar studies found that oil deposited on the beaches caused a shift in the community structure toward a hydrocarbonoclastic consortium (petroleum hydrocarbon degrading microorganisms) (Lamendella et al. 2014).

Rocky shores

Cracks and crevices, rock pools, overhangs and other shaded areas provide habitat for soft bodied animals such as sea anemones, sponges and sea- squirts, and become places where hydrocarbons can become concentrated as it strands ashore. The same is true on stable boulder shores where the rich animal communities underneath the rocks are also the most vulnerable to hydrocarbon pollution.

The vulnerability of a rocky shoreline to oiling is dependent on its topography and composition as well as its position. A vertical rock wall on a wave-exposed coast is likely to remain unoiled if an oil slick is held back by the action of the reflected waves. At the other extreme, a gradually sloping boulder shore in a calm backwater of a sheltered inlet can trap enormous amounts of hydrocarbons, which may penetrate deep down through the substratum. The complex patterns of water movement close to rocky coasts also tend to concentrate oil in certain areas. Some shores are well known to act as natural collection sites for litter and detached algae and oil is carried there in the same way. As on all types of shoreline, most of the oil is concentrated along the high tide mark while the lower parts are often untouched (IPIECA 1995).

It is not long before the waves and tides that carried the hydrocarbons onto the shore gradually remove it again, but the rate of such weathering is dependent on many factors. The oil type, wave exposure, weather conditions and the shore characteristics are most important. For example, a patch of oil on a rock exposed to heavy wave action is not going to remain there for long. However, it could take many years for the limited water movement in a sheltered bay to remove oil trapped under boulders or in gullies and crevices. Gradual leaching of this oil could result in constant low-level pollution of, for example, a rock pool. Microbial breakdown of oil is slower in cold or temperature environments than sub-tropical or tropical environments. The presence of silt and clay particles can assist with oil removal by the process of flocculation. Grazing animals such as marine snails may also remove significant amounts of oil.

As oil is weathered it becomes more viscous and less toxic, often leaving little but a small residue of tar on upper shore rocks. This residue can remain as an unsightly stain for a long time but it is unlikely to cause any more ecological damage. Oil tends not to remain on wet rock or algae but is likely to stick firmly if the rock is dry (IPIECA 1995).

Coastal TECs

The following listed TECs may be exposed to the moderate thresholds of hydrocarbons:

- Subtropical and Temperate Coastal Salt Marsh (EPBC Listed Vulnerable)
- Giant Kelp Forrest of SE Australia (EPBC Listed Endangered)
- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community (EPBC Listed Endangered)

Other Important Coastal Habitats

The following Listed RAMSAR wetlands may be exposed to the low threshold for entrained (in-water) MDO:

- Piccaninnie Ponds Karst, Victoria
- Glenleg Estuary and Discovery Bay Wetlands, Victoria
- Port Phillip Bay (western shoreline) and Bellarine peninsula, Victoria
- Western Port, Victoria
- Lavinia, Tasmania.

Listed RAMSAR wetlands are further assessed within the bird assessment above (Table 7-21).

Discovery Bay to Piccaninnie Ponds IBA

This IBA extends along the coast from Green Point in South Australia to eastern Bridgewater Bay in Victoria which is dominated by coastal scrub. It includes long stretches of exposed sandy beaches and sand dunes as well as the Glenelg Estuary and other freshwater swamps. The IBA provides non-breeding habitat for the critically endangered orange-bellied parrot, breeding habitat for the endangered Australasian bittern, and supports populations of the near threatened hooded plover (Birdlife International 2023). Additional species that utilise the IBA include the sanderling, little tern and the fairy tern.

Lawrence Rocks IBA

This IBA includes the entire terrestrial land area of Lawrence Rocks Wildlife Reserve (approximately 8.3 ha) which consists of two small islets that lie about 2 km offshore of Point Danger and 6 km south-east of Portland. Habitat on the islets consists of exposed rock and some patches of exotic grasses and native and exotic herbs. The IBA contains >10% of the global population of the Australasian gannet and is a likely breeding location for the little penguin, cape gannet, black-faced cormorant, crested tern and the silver gull (Birdlife International 2023).

Port Fairy to Warrnambool IBA

The IBA includes 17 km of beach and associated coastal dune scrub between Port Fairy and Warrnambool in western Victoria. Prominent vegetation within the area includes dense coastal dune scrub and a mosaic of aquatic herb lands, coastal saltmarsh and damp saline pasture. The IBA regularly supports a non-breeding population of the critically endangered orange-bellied parrot and a breeding population of the near threatened hooded plover (Birdlife International 2023).

Otway Range IBA

The IBA is consistent with Great Otway National Park which is approximately 150 km south-west of Melbourne. The coastline associated with this National Park runs between Torquay and Princetown with vegetation consisting of closed tussock grasslands and wind-pruned shrublands. Fifty-nine rare or threatened bird species have been recorded from Great Otway National Park, including five species listed at national level (shy albatross, wandering albatross, swift parrot, southern giant-petrel and fairy prion) and at least eighteen species listed under international treaties (Birdlife International 2023).

King Island IBA

The IBA includes: the entire coastline of King Island, which supports significant numbers of hooded plovers; Lavinia State Reserve, which supports the critically endangered orange-bellied parrot and endemic subspecies of bush birds; and three inshore islands which support large numbers of nesting seabirds. These islands are Christmas Island (a 63 ha Nature Reserve), New Year Island (a 98 ha Game Reserve, on which harvesting of shearwaters is allowed) and Councillor Island (11 ha of Crown Land). The coastline is a mixture of rocky outcrops and long sandy beaches with beach-washed kelp. The IBA is defined as the coastal strip extending from the low water mark to 1 km inland of the high-water mark around the entire island; this is intended to capture most significant habitat for shorebirds and orange-bellied parrots.

Albatross Island & Black Pyramid Rock IBA

The IBA includes of two islands offshore of north-west Tasmania which include Albatross Island (33 ha) and Black Pyramid Rock (40 ha). The coastline of Albatross Island is rocky and consists of eroded boulders, gulches and caves while the interior is composed of grasses and herbs. Black Pyramid Rock is a basaltic rock which is sparsely vegetated and surrounded by cliffs, grassy slopes and a central plateau. The IBA contains approximately 40% of the global population of the shy albatross and approximately 20% of the global population of the Australasian gannet (Birdlife International 2023). Additional species that utilise the IBA include the fairy prion, common-diving petrel, little penguin, short-tailed shearwater and the pacific and silver gull.

IBAs are further assessed within the bird assessment above (Table 7-21).

World Heritage Areas

The Tasmanian Wilderness World Heritage Area (TWWHA) may be exposed to low threshold hydrocarbons along its coastal extent of 755 km in the south-south-west of Tasmania. As described in Section 4.4.2, the region is renowned for its diversity of flora with some of the longest-lived trees and tallest flowering plants in the world and provides a stronghold for several animals that are either extinct or threatened on mainland Australia. The area is also a precious cultural landscape for Tasmanian First Nations people who have lived there for at least 35,000 years (see First Nations Heritage below). The sensitivity of marine flora and fauna to oiling is discussed in detail in the tables above.

First Nations Heritage

As described in Section 4.8.2, First Nations people have an intimate and ongoing relationship with the coastal and marine environment, with strong links to both tangible and intangible elements of the oceans. Cultural heritage sites and places including rock art, middens and stone quarry’s that are present along the coastline could also be impacted by hydrocarbons depending on location, spill trajectory and presence within area exposed to tidal inundation (Org ID: 92, Event ID: 3818, FB ID: 409). The sensitivity of marine flora and fauna to oiling is discussed in detail in the tables above.

State Marine Protected Areas

State Marine Protected Areas (MPAs) are declared with the objective of protecting the biological diversity and resources of coastal waters. The values and sensitivities of specific MPAs are described in Section 4.4.6, and include physical and ecological features of the marine environment, the sensitivity to oiling of which is discussed in detail in the tables above. Identified state-wide pressures on the Tasmanian, Victorian, South Australian and NWS marine environment relevant to the activity include marine pollution.

<table>
<tr><th colspan="2">Potential consequence from an MDO spill</th></tr>
<tr><td colspan="2">Shoreline</td></tr>
<tr><td colspan="2">The shorelines predicted to be exposed to moderate MDO loading are exposed, mostly rocky with some sandy beaches and are subject to strong wave action assisting in natural degradation of MDO.
Areas of low exposure to shoreline loading are not expected to exhibit environmental harm. Due to the exposed nature of the shoreline and the nature of MDO, long-term toxicity or smothering effects in areas of moderate MDO exposure are not expected and natural weathering should result in rapid recovery of communities. No MDO shoreline loading at the high threshold is predicted by spill modelling. Potential impacts arising from an MDO spill on socio-economic receptors (tourism, cultural and/or other social values) are more likely to occur as a result of visual/ aesthetic impacts, rather than ecological impacts of MDO at low threshold exposure.
MDO entrained in the water column (in the top 10 m) at the low threshold (10–100 ppb) has the potential to intersect sandy shorelines within western and central Victoria, King Island (Tasmania) and the southern-most sandy beaches of South Australia in the EMBA. Given the distances of these beaches from the spill location, the MDO will be highly weathered and unlikely to result in any toxicity impacts to shoreline invertebrate communities or shoreline bird species feeding on such invertebrates.
There is a 26% probability of moderate shoreline loading on the King Island coast. Much of this coastline is comprised of rocky shores with cliff-dominated coastline present adjacent the operational area.
There is a 23% probability of moderate shoreline loading on the coast of Moyne (Vic). Much of this coastline is comprised of rocky shores and cliffs which are interspersed with long sections of sandy beach.
Entrained MDO (top 10 m) at the high threshold (>100 ppb) intersects with the Twelve Apostles Marine National Park (11% probability). Entrained MDO (top 10 m) at the low threshold (10-100 ppb) intersects with Bunurong, Discovery Bay, Port Phillip Heads, Point Addis, Twelve Apostles and Wilsons Promontory.</td></tr>
<tr><th>Summary of predicted impact level to coastal habitats and communities</th><th>Risk rating</th></tr>
<tr><td rowspan="2">An MDO release has the potential to result in:
• Change in ecosystem dynamics
• Change in fauna behaviour
• Change in aesthetic value
The extent of the area of ecological impact is predicted to be within the limits of the shoreline moderate exposure threshold, and expected to be short-term and recoverable by natural degradation. While socio-economic impact is predicted to extend to the low (visible) threshold, it is similarly expected to persist short-term as a result of natural degradation.
First Nations cultural heritage sites and places intersecting the waterline may be exposed to moderate threshold hydrocarbons. However, given that the shorelines predicted to be exposed to moderate hydrocarbon threshold loading are exposed, mostly rocky and are subject to strong wave action assisting in natural degradation of hydrocarbons, no long-term or permanent changes are expected (Org ID: 92, Event ID: 3818, FB ID: 409).</td><td><u>Rocky Shores, Sandy Beaches</u>
Low
(RR I)</td></tr>
<tr><td><u>Other Coastal Habitats</u>
Low
(RR I)</td></tr>
</table>

The consequence of an MDO release to coastal habitats and communities on ecological, cultural heritage and socio-economic receptors has been assessed as **Minor (2)**, based on: • The action of reflected waves off rocky shores and exposed sandy beach, together with the predicted weathering of MDO, means it is unlikely that toxicity or smothering effects to exposed biota will occur in coastal habitats (further from the spill location). In exposed areas MDO is likely to be continually washed off the substrate and into the water, leading to further weathering. • Exposure pathways of species to weathered oil (i.e. smothering and potential ingestion for some species) are less likely to result in adverse effects. • Moderate threshold for shoreline accumulation does not overlap with any listed critical habitats but may overlap TECs. • Port Phillip Bay (western shoreline) and Bellarine peninsula, Western Port, Lavinia, Piccaninnie Ponds Karst and Glenleg Estuary and Discovery Bay listed RAMSAR wetlands are exposed to hydrocarbons only at the low threshold for entrained MDO which is unlikely to result in ecological impacts to habitat function. • State marine protected areas are mostly exposed to hydrocarbons only at the low threshold for entrained MDO which is unlikely to result in ecological impacts to habitat function; however high exposure thresholds are reached at Twelve Apostles Marine National Park (11% probability). • The visible (low threshold) EMBA overlaps with coastal areas utilised by tourism and recreation, however, the predicted weathering of MDO means that visible hydrocarbons will be present for a short time only. • An MDO release is considered to result in medium-term and localised impacts, representing a small portion of coastal habitat that is widely representative of the region, with no population level impact expected. • World Heritage Areas, such as the Tasmanian Wilderness WHA, may be exposed to hydrocarbons only at the low threshold which is unlikely to result in adverse impacts to the coastal habitat value, therefore no long-term or permanent changes to the coastal environment are expected. • During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). ConocoPhillips Australia understands that First Nations people are linked to the marine environment and may be affected by a change in the environment. Although no long-term or permanent changes to the marine environment or coastal sites and places are expected (Org ID: 92, Event ID: 3818, FB ID: 409), it is considered that the visual presence of floating oil or shoreline oil accumulations may impact Sea Country at a spiritual level (e.g., rituals, song lines, animal totems). The impacts from a release of MDO are not predicted to affect culturally important activities such as mutton-birding, or affect totem fauna. Controls are in place for all vessels engaged in Otway Exploration Drilling Program activities to reduce the risk of vessel collision and limit the total volume of MDO released. These systems are well practiced and well understood. Further, the implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by an MDO release. The likelihood is assessed as **Remote**, given the occurrence of unplanned vessel collision	**First Nations Heritage** **Low** **(RR I)** **State Marine Protected Areas** **Low** **(RR I)**

resulting in MDO release is very low. If an incident occurred, it would be restricted to localised coastal communities and unlikely to impede the recovery of coastal communities with Listed critical habitats.	

7.6.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context B** has been applied:

- Impacts are relatively well understood, and uncertainty has been managed through site specific modelling.
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Additional control measures have been considered to ensure lower and higher-order risks are managed to ALARP and acceptable levels.

Table 7-26 documents the assessment of control measures and demonstration of ALARP relevant to the accidental release of MDO.

Table 7-26: Accidental release of MDO control measures and demonstration of ALARP

Adopted Control Measures	
Control	**Source of good practice control measure**
CM01: Marine Assurance Process	All vessels contracted to ConocoPhillips Australia will have in-date certification in accordance with relevant AMSA Marine Oder requirements e.g. MO 31: SOLAS and non-SOLAS certification AMSA MO 21: Safety and emergency arrangements gives effect to SOLAS regulations dealing with life-saving appliances and arrangements, safety of navigation and special measures to enhance maritime safety. AMSA MO 30: Prevention of collisions requires that onboard navigation, radar equipment, and lighting meets the International Rules for Preventing Collisions at Sea (COLREGs) and industry standards. AMSA MO 27: Safety of navigation and radio equipment gives effect to SOLAS regulations regarding radiocommunication and safety of navigation, and provides for navigation safety measures and equipment and radio equipment requirements.
CM02: Vessel and MODU Operating Procedures	In accordance with MARPOL Annex I and AMSA MO 91 [Marine Pollution Prevention – oil], a Shipboard Marine Pollution Emergency Plan (SMPEP) or Shipboard Oil Pollution Emergency Plan (SOPEP) (according to class) is required to be developed based upon the Guidelines for the Development of Shipboard Oil Pollution Emergency Plans, adopted by IMO as Resolution MEPC.54(32) and approved by AMSA. To prepare for a spill event, the SMPEP/SOPEP details: • response equipment available to control a spill event • review cycle to ensure that the SMPEP/SOPEP is kept up to date, and • testing requirements, including the frequency and nature of these tests. In the event of a spill, the SMPEP/SOPEP details: • reporting requirements and a list of authorities to be contacted • activities to be undertaken to control the discharge of hydrocarbon, and • procedures for coordinating with local officials. Specifically, the SMPEP/SOPEP contains procedures to stop or reduce the flow of hydrocarbons to be considered in the event of tank rupture, and training requirements to support implementation. A 500 m petroleum safety zone and 2 km cautionary zone will be established around the MODU during the drilling activity. During the seabed survey a 500 m safe navigation area will be established around the survey vessel(s). At least one support vessel will accompany the MODU when in operation and when safe to do so (e.g. outside of weather event), to manage interactions with other marine users.

CM03: Marine and Coastal Users Consultation and Communication Plan	Specific notifications will be provided as follows, prior to arrival in the operational areas and on departure, so the maritime industry is aware of petroleum activities: • AMSA's Rescue Centre (ARC) (minimum two days prior) (Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 8, 9) • Australian Hydrographic Office (AHO) (minimum four weeks prior) (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 159; Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 10) • Marine and Safety Tasmania (minimum 4 weeks prior and general updates) (Org ID: 10, Maritime and Safety Tasmania, Event ID: 509, FB ID: 6, 63) • Other relevant Authorities (minimum one week prior) • Ocean Racing Club Victoria (Org ID: 510, Ocean Racing Club of Victoria (ORCV), Event ID: 2617, FB ID: 62) • 48-hour look-ahead provided every 24-hours prior to and during key periods of activity (i.e. transit of rig) (Org ID: 6, Tuna Australia, Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 473) A Safe Operations Guide will be developed and implemented that details pre-activity and on-water communication processes, including SMS messages and radio communication on Channel 16. The guide will be developed based on feedback from consultation with other marine and coastal users during the preparation of the EP and adjustment protocol (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 474; Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 427-429; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 345; Org ID: 462, Mahina Bay Fishing Co Pty Ltd, Event ID: 3432, FB ID: 344; Org ID: 607, Event ID 2527: FB ID: 102; Org ID: 593, Event ID: 2512, FB ID: 168; Org ID: 50, Tasmanian Seafood Industry Council (TSIC), Event ID: 1821, FB ID: 152; Org ID: 433, Event ID: 2663, FB ID: 135; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 14; Org ID: 471, Richey Fishing Co Pty Ltd, Event ID: 536, FB ID: 12; Org ID: 490, Event ID: 507, FB ID: 3; Document ID: 3923).
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).
CM13: NOPSEMA accepted Oil Pollution Emergency Plan (OPEP)	Under the Environment Regulation, NOPSEMA require that the petroleum activity have an accepted Oil Pollution Emergency Plan (OPEP) in place before the activity commences. In the event of an MDO release, the Otway Exploration Drilling Program OPEP will be implemented (Org ID: 111, Australian Marine Conservation Society, Event ID: 4153, FB ID: 455).
CM14: Operational and Scientific Monitoring Program (OSMP)	Under the Environment Regulation, NOPSEMA require that the Environment Plan Implementation Strategy provides for monitoring of an oil pollution emergency. The OSMP details operational monitoring to inform response planning and scientific monitoring to inform the extent of impacts from hydrocarbon exposure and potential remediation requirements.
CM18: Financial assurance for offshore activity (Org ID: 593, Event ID: 3133, FB ID: 262; Org ID: 593, Event ID: 2512, FB ID: 175, 176, 178)	Titleholders are required to hold financial assurance for offshore activities. NOPSEMA's Guideline 'Financial assurance for petroleum titles' states 'It is generally sufficient for the titleholder to hold financial assurance for the greatest reasonably credible costs, expenses and estimable third-party liabilities that may arise from a petroleum incident relating to their activities, and as defined by termination or control of the incident; operational response measures required for containment, clean up and remediation of the environment; and carrying out environmental monitoring of the impact of the petroleum incident. The scope for oil spill compensation would be in accordance with international compensation protocols such as the International Oil Pollution Compensation Funds. All claims would be assessed, reasonable evidence-based claims would be paid, and claims can be for both short-term cash flow issues and long-term losses. Suitable calculation methods would be negotiated by an independent arbiter, in the highly unlikely event or an incident.

Additional Controls Assessed			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination / Substitution			
Eliminate or substitute the use of MDO.	May reduce the total volume of MDO released	The use of MDO for the MODU, vessels and equipment cannot be eliminated. Evaluation of trade-offs indicates that substituting for another fuel, i.e. Heavy Fuel Oil or bunker fuel oil, would have a higher environmental impact. Lighter alternative fuels or wind power are not feasible as they have not been commercially proven for use in large vessels. The cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.	Reject
Remove support vessels from activity.	Eliminates potential for a vessel-to-vessel collision occurring.	Vessels are required to support operational activities and provide essential safety standby duties. Evaluation of trade-offs indicates Increased risks associated with the removal of support vessels are disproportionately higher than the benefit gained.	Reject
No refuelling to MODU at sea.	Eliminates the risk of incidents related to the transfer of fuels to the MODU.	Refuelling operations are one of the most likely causes of a hydrocarbon spill occurring during marine operations. However, given the offshore location and the inability to bring the MODU into port to refuel, this activity cannot be removed.	Reject
Reduction			
Reduce the volume of MDO carried.	May reduce the total volume of MDO released	Evaluation of trade-offs indicates that carrying less diesel would result in the need for more frequent port visits for refuelling and/or more frequent at-sea bunkering and may increase the risk of transit and bunkering related incidents. The trade-offs and associated costs are grossly disproportionate to the benefit gained.	Reject

Receptor	Sensitivity	Consequence	Likelihood	Residual Risk Rating
Benthic Assemblages	Low	Minor (2)	Remote	Low (RR I)
Plankton	Low	Minor (2)	Remote	Low (RR I)
Marine Invertebrates	Low	Minor (2)	Remote	Low (RR I)
Fish	Low	Minor (2)	Remote	Low (RR I)
Seabirds	Medium	Minor (2)	Remote	Low (RR I)
Shorebirds	High	Moderate (3)	Remote	Medium (RR II)
Aquatic birds	High	Moderate (3)	Remote	Medium (RR II)
Cetaceans	Medium	Moderate (3)	Remote	Medium (RR II)
Pinnipeds	High	Minor (2)	Remote	Low (RR I)
Marine Reptiles	Medium	Minor (2)	Remote	Low (RR I)
Commercial Fisheries	Medium	Minor (2)	Remote	Medium (RR II)
Other Marine and Coastal Users	Medium	Minor (2)	Remote	Low (RR I)
Energy Exploration and Production	Medium	Moderate (3)	Remote	Low (RR I)
Rocky shores, sandy beaches	Low	Moderate (3)	Remote	Low (RR I)
Other coastal habitats and communities	Medium	Moderate (3)	Remote	Low (RR I)
First Nations Heritage	Medium	Moderate (3)	Remote	Low (RR I)
State Marine Protected Areas	Medium	Moderate (3)	Remote	Low (RR I)

ALARP Statement	The decision context has been assessed as Type B, with predictive uncertainty managed through oil spill trajectory modelling. The residual consequence ratings are lower order – Low (RR I) to higher order – Medium (RR II). The adopted control measures minimise the likelihood of an accidental release of MDO and reduce the consequence of a release through effective response preparedness and are considered effective and appropriate to the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process but were not adopted as they did not provide further environmental benefit or were impracticable to

	implement. Therefore, the predicted risks to the environment from the accidental release of MDO associated with the Otway Exploration Drilling Program are reduced to ALARP.

7.6.7. Acceptability Assessment

Table 7-27 compares the risk levels of an MDO release against the defined acceptable levels.

Table 7-27: Comparison of defined acceptable levels with risk levels for MDO release

Defined Acceptable Levels			
Source	**Level**	**Predicted Risk Level**	**Is predicted risk below defined acceptable level?**
Principles of ESD	Activities that result in temporary/ reversible, small scale, and/or low intensity environmental damage. Environmental impacts and risks have a worst-case ranking of less than Significant (RR III).	Planned activities not expected to result in an accidental release of MDO. The highest residual risk ranking is **Medium (RR II)**.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction. Oil Spill Trajectory Modelling has been undertaken to reduce uncertainty in the spatial and temporal extent of potential impacts.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Marine pollution is a threat identified for albatross and giant-petrels in the National Recovery Plan for albatross and petrels (2022) (DCCEEW 2022e). Population monitoring is the suggested action to deal with marine pollution. The conservation advice and management plans for blue, humpback, sei and fin whales identify hydrocarbon spill as threats, though there are no specific aims to address this.	Yes
Biological Ecological Economic Cultural	No unplanned objects, emissions or discharges to sea or air. No death or injury to listed threatened or migratory species from the activity. No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health. Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted.	No spills of marine diesel oil are planned.	Yes
	All reasonably practicable control measures have been adopted to	Adopted controls measures as listed above have been assessed to ensure that environmental risks will be of an acceptable	Yes

Defined Acceptable Levels				
Source	**Level**	**Predicted Risk Level**		**Is predicted risk below defined acceptable level?**
	reduce environmental impacts and risks.	level throughout the Otway Exploration Drilling Program.		
ConocoPhillips Australia Policies	Environmental risks are consistent with environmental policies and processes such that residual environmental risks will be below Significant (RR III).	**Likelihood**	Remote (2) based upon AMSA Annual Report 2021-22	Yes
		Consequence	Moderate (3) based on highest risk rating in Table 7-28	
		Residual Risk	**Medium (RR II)**	
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to IMS have been considered (with more detail provided in Section 3). These include: • Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 370 – Modelling locations • Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467 – Southern right whale BIAs • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 285 – identification of aquaculture facilities • Org ID: 593, Event ID: 3133, FB ID: 262; Org ID: 593, Event ID: 2512, FB ID: 175, 176, 178– Impacts to coastal communities and financial assurance • Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421 – impacts of spills to giant crab fisheries • Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386 – impacts of spills to Zeehan MP • Org ID: 111, Australian Marine Conservation Society, Event ID: 4153, FB ID: 455 – Spill response plan • Org ID: 92, Event ID: 3818, FB ID: 409 – Impacts to cultural heritage along the coastline • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • (Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 8, 9) – AMSA notifications • (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 159; Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 10) – AHO notifications		Yes

Defined Acceptable Levels			
Source	**Level**	**Predicted Risk Level**	**Is predicted risk below defined acceptable level?**
		• (Org ID: 10, Maritime and Safety Tasmania, Event ID: 509, FB ID: 6, 63) – MAST notifications • (Org ID: 510, Ocean Racing Club of Victoria (ORCV), Event ID: 2617, FB ID: 62) – Ocean Racing Club Victoria notifications • (Org ID: 6, Tuna Australia, Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 473) – 48-hour look ahead	
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type B risks are considered acceptable if the requirements in Table 7-28 can be demonstrated and if the level of residual risk has a rating less than Significant (RR III)). Following completion of the risk assessment process, the environmental risks arising from an accidental release of MDO are acceptable because: • The impacts associated with an MDO release are relatively well known and engineering risk-based tools have been used to assess the results of oil spill trajectory modelling • Training of MODU and vessel crews in the storage, use, handling and transfer of MDO are well understood, as are the requirements of the SMPEP/SOPEP • Regulatory guidelines controlling MDO handling are known • Good practice controls are well defined and well implemented, and • In the unlikely event of a release of MDO, the MODU and vessel operators have a SOPEP/SMPEP in place and ConocoPhillips Australia has an OPEP in place to facilitate a rapid and effective response and an OSMP to support the initial response and monitor impact and recovery over time. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the risks of an accidental release of MDO. Based on the above evaluation, the risks associated with an accidental release of MDO meet the defined acceptable levels.		

7.6.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with an accidental release of MDO from the Otway Exploration Drilling Program are:

- EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO7: No unplanned objects, emissions or discharges to sea or air.
- EPO10: No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

7.7. Loss of Well Control

7.7.1. Hazards

During drilling there is a risk of a loss of well control (LOWC) event as a result of:

- A loss of well integrity i.e. from failure of multiple well control barriers.

In the event of a LOWC, condensate may be released into the marine environment from either the MODU drill floor or seabed.

7.7.2. Spill Modelling

As the risk of a LOWC event cannot be eliminated, detailed response plans are required to be developed to demonstrate preparedness in the extremely unlikely event that a spill occurs (see Appendix I). Oil spill modelling is required to support the development of these response plans. Modelled simulations provide an informed estimate of where the oil might go if nothing is done to respond and allows the prediction of possible effects. However, as metocean conditions like currents, wind, waves and temperature are always changing, stochastic modelling is undertaken whereby hundreds of hypothetical spills are simulated under different conditions to show where oil from a spill could go.

ConocoPhillips Australia commissioned RPS Group (RPS) to conduct stochastic modelling and deterministic analysis (Appendix E) to predict the potential impacts from exposure from a subsea LOWC release of 139,400 m^3 of condensate over 90 days. This scenario represents an unrestricted open-hole release from a high productivity gas condensate reservoir at a depth of 2,820 mTVDSS, which assumes the failure of multiple control systems, and is considered the worst-case credible LOWC scenario that could potentially occur during the activity. The calculation of LOWC has been performed in alignment with methodology detailed within the Society of Petroleum Engineers (SPE) Technical Report: Calculation of Worst-Case Discharge (WCD) (April 2015).

RPS conducted modelling for activities across three broad areas during the exploration program, being the northern extent of VIC/P79, the southern extent of VIC/P79 and across T/49P (Appendix E). The locations were selected to be representative of all potential activity locations within the operational areas based on water depth, proximity to the coast and continental slope (Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 370).

The modelled duration of this release represents the time determined to implement a full dynamic well kill via the drilling of a relief well which includes the mobilisation for a suitable drilling unit within the region (North West Shelf/Timor sea).

ConocoPhillips Australia has a high degree of confidence in the estimated release rates as they are based on known reservoir properties in the region from both a flow dynamic viewpoint and the composition of the reservoir fluids. The composition used was based on the Thylacine reservoir gas composition, adjusted to meet an expected worst-case condensate-gas ratio of 20 bbl/MMscf. The Thylacine field is one of the most productive fields in the region producing from the same formations which ConocoPhillips Australia intends to target. Release rates and volumes are based on a total loss of well control which assumes the failure of multiple control systems.

Stochastic modelling, created by overlaying hundreds of individual computer-simulated hypothetical spills, provides a basis for response planning by defining the Planning Area within which the probabilities of exposure are calculated for environmental values and sensitivities and protection priorities are established.

Analysis of all the simulations developed during stochastic modelling is conducted to identify hypothetical simulations that predicted possible worst-case outcomes, typically based on the maximum volume of oil (hydrocarbon) ashore, the largest swept area (area of floating hydrocarbon), minimum time to shoreline and longest length of shoreline contacted by hydrocarbons. Deterministic analysis is used for preparedness and response planning to establish the type and number of resources (e.g., equipment) needed to be available for immediate deployment.

In the highly unlikely event of a LOWC, the response will include integration with local, national and international response organisation to mobilise resources including experts and specialist equipment. Details on resourcing and response arrangements for an LOWC spill are included in the Oil Pollution Emergency Plan (OPEP) in Appendix I.

Refer to the following section for further information on stochastic modelling. Details of modelling scenarios are provided in the modelling report (RPS 2023) (Appendix E).

7.7.2.1. Characteristics of Condensate

The characteristics for the condensate have been based on a Thylacine condensate analogue. Thylacine condensate has low density, low pour point, low dynamic viscosity and a relatively low boiling point (Table 7-28 and Table 7-29), indicating that it will spread quickly when spilled at sea and quickly thin out, increasing the expected rate of evaporation.

ConocoPhillips Australia has a high degree of confidence in the suitability of the Thylacine gas condensate as the analogue for analysis. The Thylacine field is one of the most productive fields in the region producing from the same formations which ConocoPhillips intends to target.

Based on the fates and weathering modelling report produced for condensate, volatile to semi-volatile components (boiling point (BP) < 265 °C), which represent approximately 83% of the whole condensate is likely to evaporate over the first day if exposed to the atmosphere at local temperatures, leaving the less volatile portion (16%) to progressively evaporate more slowly, with only 1% of the condensate considered persistent (RPS 2023).

The heavier components (i.e. low volatile portion) of the condensate will tend to entrain into the upper water column during the presence of moderate winds (> 10 knots) and can potentially remain entrained for as long as the winds persist. But can subsequently resurface when the winds ease, and waves abate.

Table 7-28: Condensate physical characteristics (based on Thylacine analogue)

Parameter	Characteristics
Density (kg/m^3)	805 at 15°C
API	44.3
Dynamic viscosity (cP)	0.875 at 20°C
Oil category	Group I
Oil persistence classification	Non-persistent oil

Table 7-29: Condensate boiling point ranges (based on Thylacine analogue)

Characteristic	Non-Persistent			Persistent
	Volatiles (%)	Semi-volatiles (%)	Low volatiles (%)	Residual (%)
Boiling point (°C)	<180	180 – 265	265 – 380	>380

Thylacine condensate	64	19	16	1

7.7.2.2. Hydrocarbon Exposure Thresholds

Refer to Section 7.6.2.3 for details on hydrocarbon exposure thresholds applied in the modelling.

7.7.2.3. Modelling Results for T/49P

Stochastic modelling results for the hypothetical LOWC scenario within permit area T/49P are presented in the following sections for sea surface floating oil, shoreline, dissolved and entrained hydrocarbons. Deterministic analysis for the simulations that resulted in the largest volume of oil ashore for T/49P scenarios is presented in Appendix E.

The extent of potential hydrocarbon exposure at moderate thresholds for the LOWC scenario is presented in Figure 7-4. It is important to note that this figure does not represent the predicted extent of any single spill but rather represents the overlay of hundreds of hypothetical spills, to provide a basis for response planning.

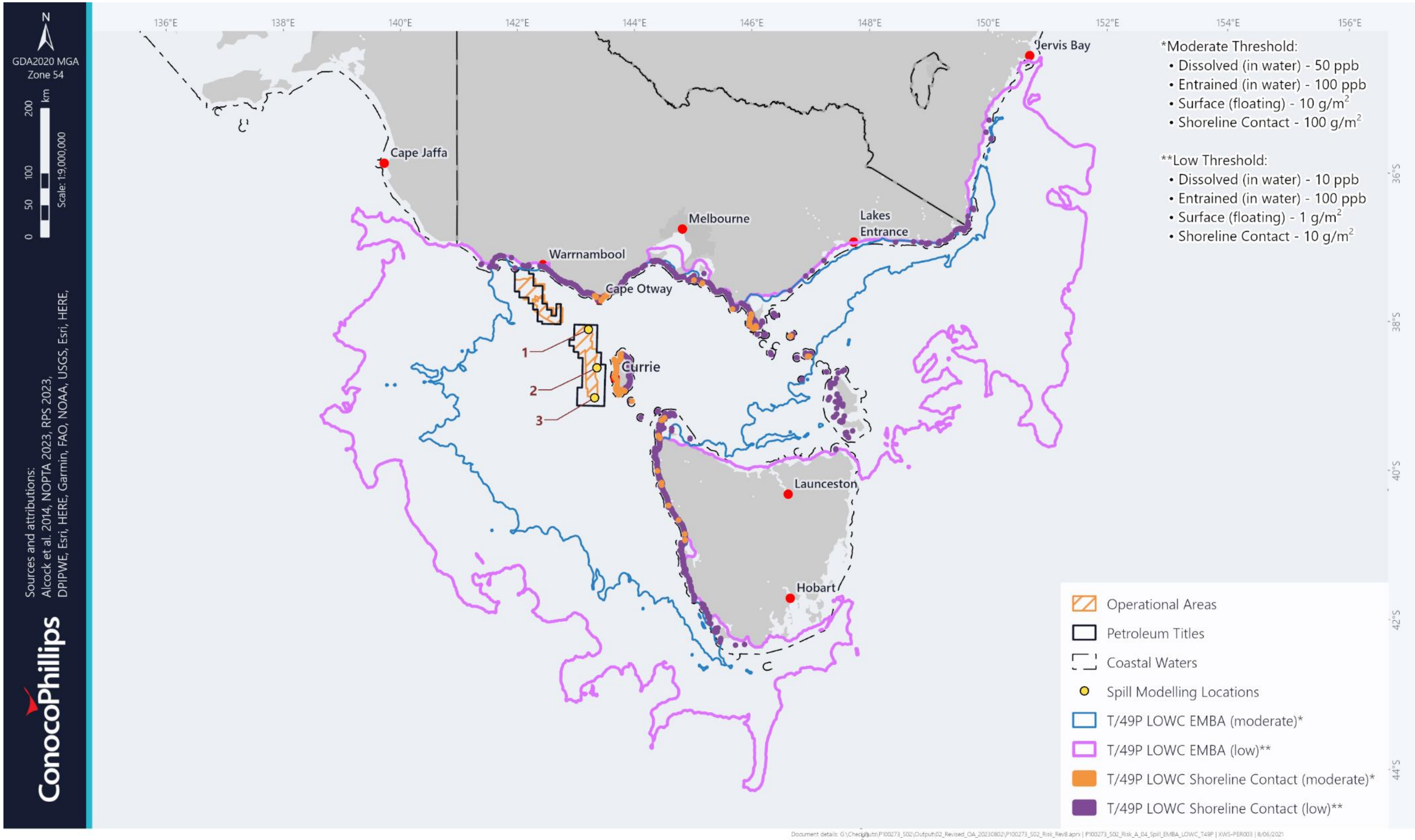


Figure 7-4: LOWC low/moderate threshold EMBA for T/49P (source: RPS 2023)

Sea Surface (Floating) Hydrocarbon Exposure

Moderate (10 g/m^2) exposure to surface hydrocarbons were predicted to travel a maximum distance of 42.7 km from release Location 2 during both summer and winter, respectively.

Moderate floating oil exposure was predicted to occur with 100% probability within:

- The Otway IMCRA, with a minimum time to exposure of 0.08 days in both summer and winter.
- The Zeehan AMP, with a minimum time to exposure of 0.08 days in both summer and winter.

Moderate exposure to floating oil is also predicted in King Island IBA (11 % probability), King Island nearshore waters (11% probability) and Tasmanian State Waters (11% probability).

High floating oil exposure (100 g/m^2) was predicted within the Otway IMCRA (1% probability) and in the Zeehan AMP (1% probability), both with a minimum time to exposure of 48.92 days during summer.

Shoreline Hydrocarbon Exposure

Shoreline contact at or above the low (10 g/m^2) threshold was predicted to occur within a minimum of 3.21 days during winter. The maximum volume of 196.6 m^3 and average volume of 73.9 m^3 of oil ashore, and maximum of 50 km and average of 28.9 km of shoreline exposed at the moderate threshold (100 g/m^3) were also predicted for spills originating from Location 2 during winter.

For location 2, high shoreline hydrocarbon exposure was only predicted to occur at King Island (80% probability during winter conditions), with minimum time to contact of 9.75 days.

Moderate shoreline hydrocarbon exposure was predicted at:

- King Island (100% probability) with a minimum time to contact of 4.04 days during winter.
- Kent Island Group (5% probability) with a minimum time to contact of 41.79 days during winter.
- Circular Head (2% probability) with a minimum time to contact of 64.92 days during winter.
- Norman Islands (1% probability) with a minimum time to contact of 115.88 days during winter.
- Norman Islands (1% probability) with a minimum time to contact of 115.88 days during winter.
- South Gippsland (1% probability) with a minimum time to contact of 53.17 days during winter.
- Wilsons Promontory (West) (1% probability) with a minimum time to contact of 53.17 days during winter.

Dissolved Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the maximum distance predicted for dissolved hydrocarbon exposure was at Location 1. The maximum distance from the release Location 1 to the low (10 ppb), moderate (50 ppb) and high (400 ppb) dissolved hydrocarbon exposure thresholds was 769 km (winter), 722 km (winter) and 452 km (winter), respectively.

High exposure thresholds for in-water (dissolved) hydrocarbons are predicted 100% probability at Apollo AMP and Otway IMCRA during summer and winter, and Central Bass Strait IMCRA during winter. Other receptors with a high probability of exposure to high thresholds include Central Victoria IMCRA (43% probability) during winter, West Tasmanian Canyons KEF (24% probability) during summer, and Tasmanian State waters (23%) during winter.

Moderate exposure thresholds are predicted at:

- Apollo AMP and Otway IMCRA (100% probability) during both summer and winter, and Central Bass Strait IMCRA (100%) during winter.

- Central Victoria IMCRA (96% probability) during winter.
- Tasmanian State Waters (86% probability) and Victorian State Waters (66%) during winter.
- Zeehan AMP (73% probability) and West Tasmania Canyons KEF (71%) during summer.
- King Island IBRA and nearshore waters (62% probability) during winter
- Flinders IMCRA (41% probability), Otway Plain IBRA and Colac Otway nearshore waters (34%), Wilsons Promontory and Rodondo Island nearshore waters (31%), Moncoeur Islands nearshore waters (30%), Beagle AMP and Otway Ranges IBRA (27%) during winter.
- Braveness Rock RS (30%), Corangamite nearshore waters (17%), and Warrnambool Plain IBRA (15%) during summer.
- Cuter Rock RSB (24%), Wilsons Promontory MNP and Kanowna Island nearshore waters (23%), Skull Rock (22%), Upwelling East of Eden KEF (20%), Marengo Reefs (18%), Twofold Shelf IMCRA (17%), Answer Island nearshore waters (16%), Flinders IBRA (15%), Twelve Apostles MNP and Hogan Island Group nearshore waters (15%), Curtis Island and Glennie Group nearshore waters (13%), and Cody Bank RSB (12%) during winter.
- Various receptors predicted below <10% probability during summer and/or winter.

Entrained Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the maximum distance predicted for entrained hydrocarbon exposure at high thresholds was at Location 1. The maximum distance from the release location to the low (10 ppb) entrained hydrocarbon thresholds was 833 km (winter) and 822 km (summer) and to the high (100ppb) was 665 km (winter) and 666 km (summer), respectively.

High exposure to thresholds for in-water (entrained) hydrocarbons are predicted with a 100% probability (summer and winter) at Apollo AMP, Central Bass Strait IMCRA, and Otway IMCRA. Other receptors with a high probability of exposure to high thresholds include, Central Victoria IMCRA (96% in winter), Tasmanian state waters (93% in winter), West Tasmania Canyons KEF (86% in summer), King Island IBRA (78% in winter) and Zeehan AMP (74% in summer).

7.7.2.4. Modelling Results for Southern Extent of VIC/P79

Stochastic modelling results for the hypothetical LOWC scenario within the southern extent of the operational area for permit area VIC/P79 are presented in the following sections for sea surface floating oil, shoreline, dissolved and entrained hydrocarbons. Deterministic analysis for the simulations that resulted in the largest volume of oil ashore for the southern extent of the VIC/P79 scenarios is presented in Appendix E.

The extent of potential hydrocarbon exposure at moderate thresholds for the LOWC scenario is presented in Figure 7-5. It is important to note that this figure does not represent the predicted extent of any single spill but rather represents the overlay of hundreds of hypothetical spills, to provide a basis for response planning.

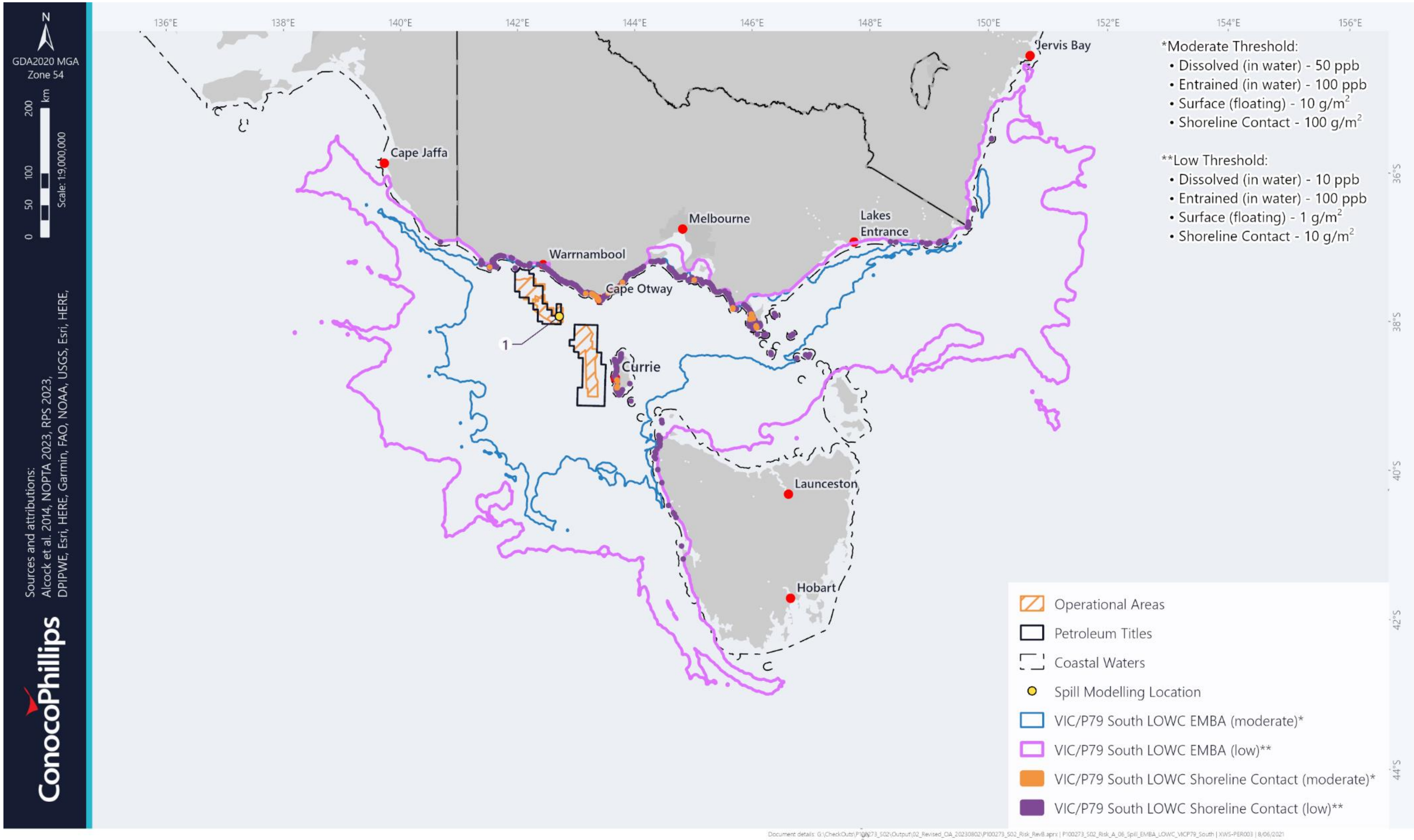


Figure 7-5: LOWC low/moderate threshold EMBA for southern extent of VIC/P79 (source: RPS 2023)

Sea Surface (Floating) Hydrocarbon Exposure

Moderate (10 g/m^2) exposure to surface hydrocarbons were predicted to travel a maximum distance of 11.6 km and 9.3 km from release Location 1 during summer and winter, respectively.

Moderate floating oil exposure was predicted to occur with 100% probability within:

- The Otway IMCRA, with a minimum time to exposure of 0.04 days in summer and 0.08 days in winter.

Shoreline Hydrocarbon Exposure

Shoreline contact at or above the low (10 g/m^2) threshold was predicted to occur within a minimum of 4.08 days during winter. The maximum volume of 51.9 m^3 and average volume of 13 m^3 of oil ashore, and maximum of 11 km and average of 3.7 km of shoreline exposed at the moderate threshold (100 g/m^3) were also predicted for spills originating from Location 1 during winter.

High shoreline hydrocarbon exposure was not predicted to occur.

Moderate shoreline hydrocarbon exposure was predicted to occur during winter conditions at:

- Colac Otway (15% probability) with a minimum time to contact of 14.38 days.
- Glenelg (1% probability) with a minimum time of 95.42 days.
- King Island (32% probability) with a minimum time to contact of 15.04 days.
- Norman Island (9% probability) with a minimum time to contact of 39 days.
- South Gippsland (16% probability) with a minimum time of 14.08 days.

Moderate shoreline hydrocarbon exposure was predicted to occur during summer conditions at:

- Colac Otway (17% probability) with a minimum time to contact of 8.71 days.
- Corangamite (1% probability) with a minimum time to contact of 78.04 days.
- Glenelg (3% probability) with a minimum time of 31.46 days.
- King Island (9% probability) with a minimum time to contact of 16.13 days.
- South Gippsland (1% probability) with a minimum time of 96.46 days.

Dissolved Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the maximum distance predicted for dissolved hydrocarbon exposure was at Location 1. The maximum distance from the release Location 1 to the low (10 ppb), moderate (50 ppb) and high (400 ppb) dissolved hydrocarbon exposure thresholds was 748 km (winter), 625 km (summer) and 367 km (summer), respectively.

High exposure thresholds for in-water (dissolved) hydrocarbons are predicted 100% probability at, Otway IMCRA during summer and winter.

Moderate exposure thresholds are predicted at:

- West Tasmanian Canyons KEF (summer), Central Bass Strait (winter), Central Victoria IMCRA (winter), and Otway IMCRA (summer and winter) (100% probability).
- High probability at Zeehan AMP (79% during summer) and Victorian state waters (79%).

Entrained Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the maximum distance predicted for entrained hydrocarbon exposure at high thresholds from the release Location 1 to the low (10 ppb) entrained hydrocarbon thresholds was 868 km (summer) and 867 km (winter) and to the high (100ppb) was 440 km (winter) and 699 km (summer), respectively.

High exposure to thresholds for in-water (entrained) hydrocarbons are predicted with a 100% probability at Apollo AMP, Central Victoria IMCRA and Otway IMCRA (summer and winter), Central Bass Strait IMCRA (winter).

Other receptors with a high probability of exposure to high thresholds include, Zeehan AMP (81% in summer), Tasmanian state waters (81% in winter), and Victorian state waters (84% in winter).

7.7.2.5. Modelling Results for Northern Extent of VIC/P79

Stochastic modelling results for the hypothetical LOWC scenario within the northern extent of permit area VIC/P79 are presented in the following sections for sea surface floating oil, shoreline, dissolved and entrained hydrocarbons. Deterministic analysis for the simulations that resulted in the largest volume of oil ashore for the northern extent of VIC/P79 is presented in Appendix E.

The extent of potential hydrocarbon exposure at moderate thresholds for the LOWC scenario is presented in Figure 7-6. It is important to note that this figure does not represent the predicted extent of any single spill but rather represents the overlay of hundreds of hypothetical spills, to provide a basis for response planning.

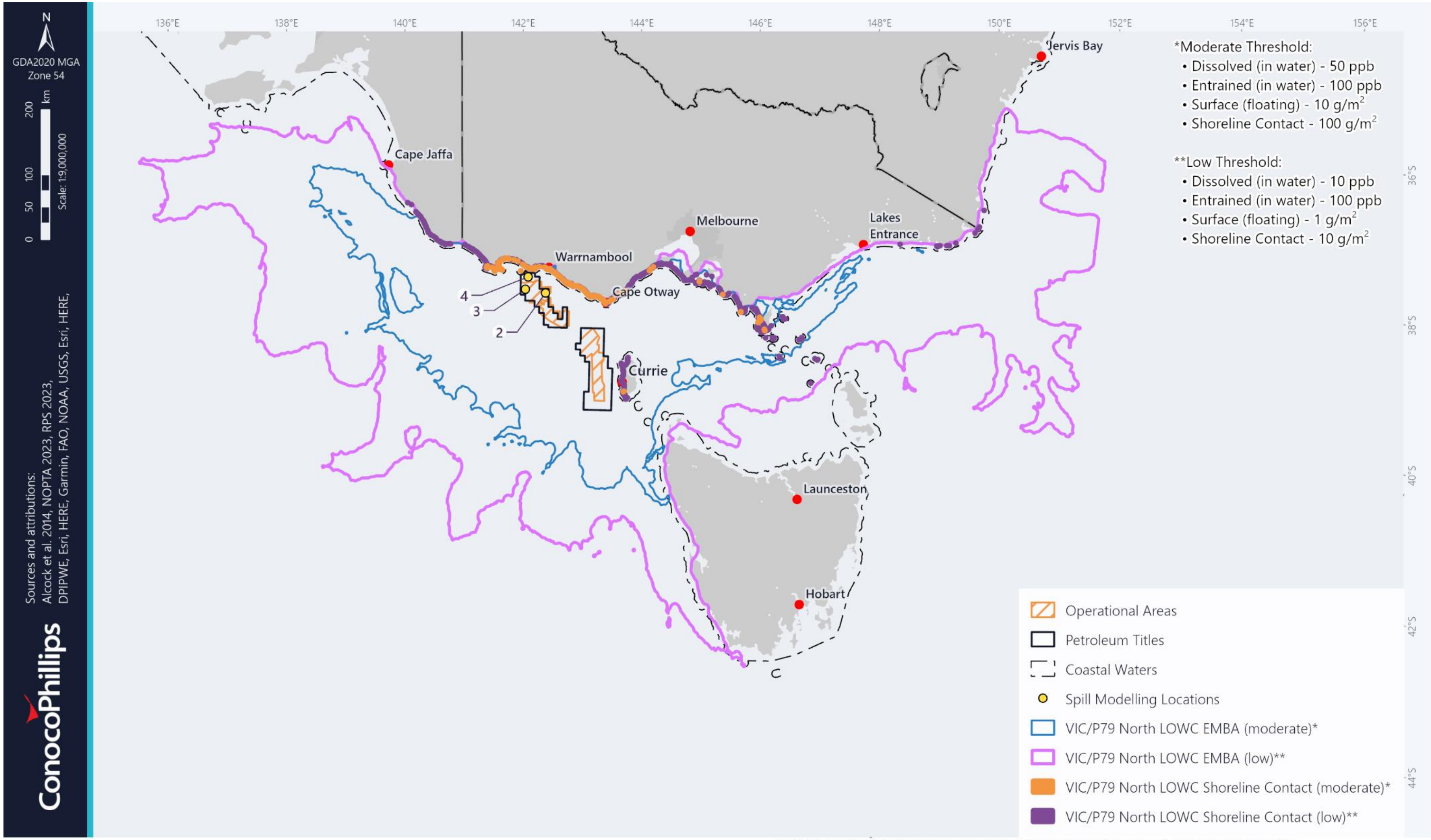


Figure 7-6: LOWC low/moderate threshold EMBA for northern extent of VIC/P79 (source: RPS 2023)

Sea Surface (Floating) Hydrocarbon Exposure

Moderate (10 g/m^2) exposure to surface hydrocarbons were predicted to travel a maximum distance of 11.6 km and 12.3 km from release Location 3 during summer and winter, respectively.

Moderate floating oil exposure was predicted to occur with 100% probability within:

- The Otway IMCRA, with a minimum time to exposure of 0.04 days in summer and 0.08 days in winter.

Moderate exposure to floating oil is also predicted in Bonney Coast Upwelling (47% probability during winter) and Victorian State Waters (1% probability).

High floating oil exposure (100 g/m^2) was only predicted within the Otway IMCRA (3% probability) with a minimum time to exposure of 1.21 days during summer.

Shoreline Hydrocarbon Exposure

Shoreline contact at or above the low (10 g/m^2) threshold was predicted to occur within a minimum of 1.92 days. The maximum volume of 318.9 m^3 and average volume of 126.9 m^3 of oil ashore, and maximum of 76 km and average of 38.4 km of shoreline exposed at the moderate threshold (100 g/m^3) were also predicted for spills originating from Location 3 during winter.

High shoreline hydrocarbon exposure was predicted at:

- Moyne (16% probability), with minimum time to contact of 16.96 days during winter.
- Lady Julia Percy Island (9% probability), with minimum time to contact of 3.63 days during winter.
- Warrnambool (2%) with minimum time to contact of 32.5 days during winter.
- Glenelg (2% probability), with minimum time to contact of 37.04 days during summer.

Moderate shoreline hydrocarbon exposure was predicted at:

- Moyne (100% probability) with a minimum time to contact of 3.38 days during winter.
- Corangamite (96% probability) with a minimum time to contact of 4.83 days during winter.
- Warrnambool (88% probability) with a minimum time to contact of 3 days during winter.
- Lady Julia Percy Island (67% probability) with a minimum time to contact of 2.29 days during summer.
- Colac Otway (66% probability) with a minimum time to contact of 14.08 days during winter.
- Laurence Rocks (47% probability) with a minimum time to contact of 6.92 days during summer.
- Glenelg (23% probability) with a minimum time to contact of 18.17 days during summer.
- South Gippsland (12% probability) with a minimum time to contact of 22.21 days during winter.
- Norman Island (6% probability) with a minimum time to contact of 21.92 days during winter.
- Bass Coast (1% probability) with a minimum time to contact of 109.75 days during winter.

Dissolved Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the maximum distance predicted for dissolved hydrocarbon exposure was at Location 2. The maximum distance from the release Location 1 to the low (10 ppb), moderate (50 ppb) and high (400 ppb) dissolved hydrocarbon exposure thresholds was 804 km (summer), 451 km (winter) and 319 km (summer), respectively.

High exposure thresholds for in-water (dissolved) hydrocarbons are predicted 100% probability Otway IMCRA (summer and winter). Other receptors with a high probability of exposure to high thresholds include Bonney Coast Upwelling (69%).

Moderate exposure thresholds are predicted at Twelve Apostles and Victorian State Waters at 100% probability during winter, including:

- High probability at Apollo AMP (97%), Otway Plain IBRA (98%), Otway Ranges IBRA (98%), Central Bass Strait IMCRA (94%), Central Victoria IMCRA (96%), Bonney Coast Upwelling (88%), Braveness Rock (98%), Colac Otway nearshore waters (98%), Corangamite nearshore waters (98%), Moyne (84%) during winter.

Entrained Hydrocarbon In-water Exposure

Based on the 1-hour (instantaneous) exposure window, the maximum distance predicted for entrained hydrocarbon exposure at high thresholds was at Location 1. The maximum distance from the release location to the low (10 ppb) entrained hydrocarbon thresholds was 856 km (winter) and 879 km (summer) and to the high (100ppb) was 477 km (winter) and 437 km (summer), respectively.

High exposure to thresholds for in-water (entrained) hydrocarbons are predicted with a 100% probability at Victorian State Waters and Otway IMCRA during summer and winter, and Apollo AMP, Otway Plain IBRA, Otway Ranges IBRA, Warrnambool Plain IBRA, Central Victoria IMCRA, Colac Otway Nearshore waters, Corangamite nearshore waters, Twelve Apostles MNP, Bravenes Rock RSB during winter

Other receptors with a high probability of exposure to high thresholds include, Central Victoria IMCRA (96% in winter), Tasmanian state waters (93% in winter), West Tasmania Canyons KEF (86% in summer), King Island IBRA (78% in winter) and Zeehan AMP (74% in summer).

7.7.3. Environmental Impacts

In the event of loss of well control, the known environmental impacts will include a:

- Change in water quality

A change in water quality can result in a range of environmental impacts, including:

- Change in fauna behaviour
- Injury / mortality to fauna
- Change in habitat
- Change in ecosystem dynamics and conservation values and sensitivities, and
- Changes to the functions, interests, or activities of other users.

7.7.4. Identifying Sensitive Receptors

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of risks associated with a LOWC, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Values of World heritage properties
- Values of National heritage places
- Ecological character of a declared RAMSAR wetland
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

A LOWC condensate release can cause significant impacts on ecological, social, economic and cultural values of marine and coastal environments including:

- Change in fauna behaviour and injury / mortality to fauna, potentially impacting:
    - Plankton
    - Marine invertebrates
    - Fish
    - Seabirds and Shorebirds
    - Marine reptiles
    - Marine mammals (e.g. pinnipeds and cetaceans)
- Change in habitat, potentially impacting:
    - Benthic habitats (e.g. algae, soft coral, seagrass and saltmarsh)
    - Coastal habitats and communities
- Changes in ecosystem dynamics, potentially impacting:
    - State protected areas (marine)
    - Australian marine parks (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386)
    - Key ecological features
    - Wetlands
- Changes to the functions, interests or activities of other users and aesthetic values, potentially impacting:
    - Tourism (including recreational diving and fishing)
    - Commercial fisheries
    - Coastal habitats and communities, including First Nations heritage and world heritage areas
    - Defence
    - Shipping
    - Offshore Petroleum Activities.

Although the EPBC PMST report for the MDO EMBA did not identify any threatened marine invertebrate species or benthic habitats, feedback was received during consultation regarding the impact of a spill on the giant crab fishery (Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421).

7.7.5. Evaluation of Environmental Risks

An assessment of historical LOWC incidents was undertaken using the IOGP Risk Assessment Data Directory (2019). This provided an indicative probability of a LOWC from exploration drilling that can be reasonably expected to occur, based on previous incidents. The chances of the activity resulting in a LOWC event are 1.6×10^{-4} per well drilled, i.e. there is a 0.016% chance that the event may occur, which corresponds to a likelihood ranking of **Remote (2)**.

The criteria used to determine the sensitivity of receptors that may be affected by a LOWC condensate release are presented in Table 7-16. The potential consequences of the LOWC condensate spill scenario on key receptors within the EMBA are discussed in Table 7-30 to Table 7-38, and the inherent risk rating is calculated for each.

Table 7-30: Potential risk of LOWC condensate release on benthic and intertidal assemblages

<table>
<tr><th colspan="3">General sensitivity to oiling – benthic and intertidal assemblages (excluding marine invertebrates – refer to Table 7-32)</th></tr>
<tr><td colspan="2">Sensitivity rating of benthic assemblages</td><td>Low</td></tr>
<tr><td colspan="2">A description of benthic assemblages in the EMBA is provided in:</td><td>Section 4.6.1.1</td></tr>
<tr><td colspan="3">Refer to Table 7-5 (in Section 7.6) for details on general sensitivity of benthic assemblages, including marine flora, to oiling.
Saltmarsh
Intertidal saltmarshes are considered to have a high sensitivity to hydrocarbon exposure. Saltmarsh vegetation offers a large surface area for oil absorption and tends to trap oil.
Evidence from case histories and experiments shows that the damage resulting from oiling, and recovery times of oiled marsh vegetation, are very variable. In areas of light to moderate oiling where oil is mainly on perennial vegetation with little penetration of sediment, the shoots of the plants may be killed but recovery can be relatively rapid, occurring the following growing season or earlier. However, when oil penetrates the soil and the initial mortality of the vegetation is extensive, recovery to reference conditions may take 3–4 years (Hester and Mendelssohn 2000).</td></tr>
<tr><th colspan="3">Potential consequence from LOWC condensate release</th></tr>
<tr><th>Sea Surface</th><th>Dissolved and Entrained Hydrocarbon In-water</th><th>Shoreline</th></tr>
<tr><td>Marine Flora
Floating life phase of vegetation in western Bass Strait may be exposed to limited areas of moderate hydrocarbons at the sea surface. Given the nature of the spill in this scenario (occurring in high energy waters >20 m deep) limited floating vegetation is expected to be present resulting in consequence to marine flora assemblages to be Minor.
Other Benthic Assemblages
Given these assemblages are benthic, exposure to surface (floating) hydrocarbons is not expected.</td><td>Marine Flora
Offshore waters are predicted to be exposed to moderate and high thresholds of dissolved and entrained in-water hydrocarbons at 100% probability, including Apollo AMP, Zeehan AMP, King Island IBRA, Otway IMCRA, Central Bass Strait IMCRA, Warrnambool Plain, Colac Otway NS waters, Corangamite NS waters, Twelve Apostle MNP, Braveness Rock RSB and Tasmanian state waters.
Nearshore waters are predicted to be exposed to high and moderate thresholds of dissolved and entrained in-water hydrocarbons at varying probabilities. High exposure thresholds for in-water (dissolved) hydrocarbons are predicted 100% probability at Colac Otway and Corangamite nearshore waters.
Seagrass may be present within the area predicted to be exposed to in-water hydrocarbons (e.g. seagrass is known</td><td>Marine Flora
Shoreline accumulation of hydrocarbons at the low threshold is unlikely to have an ecological impact.
High threshold shoreline loading is predicted at King Island (80%), Moyne (16%). Lady Julia Percy Island (9%), Warrnambool (2%), and Glenelg (2%). Moderate shoreline loading is predicted to the occur at multiple receptors, including several islands and island groups. At this threshold, there may be ecological impacts to benthic assemblages stranded on the shoreline. Wave action at the shoreline and the high volatility of the condensate will result in fast weathering of any shoreline hydrocarbons.
Intertidal saltmarsh habitat, such as Lavinia State Reserve on King Island and Glenelg Estuary and Discovery Bay Wetlands to a lesser extent in the western Victoria, has the potential to be exposed by >100 g/m² shoreline hydrocarbons.</td></tr>
</table>

	to occur within areas around Kent Island Group and the Bass Strait Islands) (Section 4.6.1.4). Due to the physical properties of the hydrocarbons and the well- mixed nature of the waters of the EMBA, coating of benthic assemblages and prolonged exposure to hydrocarbons is considered highly unlikely. Thus, the consequence to marine flora assemblages from exposure to moderate threshold in-water hydrocarbons is **Minor**. **Other Benthic Assemblages** Within the shallow coastal shelf in-water (dissolved) hydrocarbon exposure at low and moderate thresholds is predicted, while in-water (entrained) at low, moderate, and high thresholds is predicted. Entrained hydrocarbon exposure at high thresholds is only predicted at 100% for Colac Otway and Corangamite nearshore waters. Dissolved hydrocarbon exposure at moderate thresholds is predicted at 100% at Twelve Apostles, Colac Otway near shore waters (98%) and Corangamite nearshore waters (98%), followed by King Island nearshore waters (62%). At these thresholds, there may be ecological impacts to benthic assemblages within the intertidal area, thus, the consequence to other benthic assemblages' communities from exposure to moderate and greater threshold hydrocarbons is **Moderate**.	Saltmarsh habitat within the Lavinia State Reserve provides foraging habitat to the critically endangered orange bellied parrot and the endangered green and gold frog (DoE 2014d). The oil (in liquid form) will readily adhere to the marshes, coating the stems from tidal height to sediment surface. Heavy oil coating would be expected to be restricted to the outer fringe of thick vegetation, although lighter oils can penetrate deeper, to the limit of tidal influence. The consequence of exposure to moderate and high threshold shoreline loading to marine flora assemblages is **Moderate**. **Other Benthic Assemblages** Benthic assemblages are not associated with intertidal areas and are therefore not anticipated to be affected by shoreline hydrocarbon exposure.

Summary of predicted impact level to benthic assemblages	Risk rating
A LOWC condensate release has the potential to result in: • change in ecosystem function • injury/mortality to biota The extent of the area of impact is limited to coastal waters less than 30 m deep. The consequence of a LOWC condensate release on ecosystem function and injury/ mortality to benthic assemblage biota has been assessed as **Moderate (3)**, based on: • Impacts on benthic assemblages (i.e. marine flora and other) associated with oil smothering, fouling and asphyxiation is expected to be limited based on the following: ○ Common feature of macroalgae is the presence of a mucous coating that prevents oil adherence.	**Benthic Assemblages** **Medium (RR II)**

- Water soluble components of condensate are expected to be rapidly weathered and, as such, toxicity of water-soluble portion is reduced by the time it enters shallow coastal waters where interaction with benthic assemblages attached to seabed are more likely. • Intertidal macroalgal beds are more prone to oil spills than subtidal beds, however given the exposed nature of these shorelines weathering of hydrocarbons is expected to be rapid, limiting the duration of exposure. • Macroalgae tend to exhibit rapid recovery from oil spill due to common growth habitat where new growth occurs near the base of the plant while the distal parts (which would be exposed to the oil contamination) are continually lost. • Saltmarsh habitats, including designated conservation areas, support important behaviours for listed species • The Conservation Advice for Giant Kelp Marine Forests of South East Australia (a Threatened Ecological Community (TEC)) does not identify oil spill or acute pollution as a key threat to survival. • LOWC is considered to result in medium-term and localised impacts to a small portion of benthic habitat that is widely representative of the region, with no population level impact expected. • Although short-term changes to benthic assemblages may occur, conservation values of protected areas are not expected to be affected in response to predicted impacts of LOWC release including at Apollo AMP, Beagle AMP, Boags AMP, Franklin AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF, Big Horseshoe Canyon KEF or Upwelling East of Eden KEF. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. Impacts are restricted to localised coastal areas within the photic zone (up to 30 m depth) and would be unlikely to impede the recovery of a benthic assemblages, including those identified as a TECs.	

Table 7-31: Potential risk of LOWC condensate release on plankton

General sensitivity to oiling - plankton		
Sensitivity rating of plankton	**Low**	
A description of plankton in the EMBA is provided in:	Section 4.6.3	
Refer to Table 7-18 7-18 (in Section 7.6) for details on general sensitivity of plankton, including krill, to oiling.		
Potential consequence from LOWC condensate release		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Plankton found in open water of the EMBA is expected to be widely represented in the Bass Strait and Otway region. Plankton in the upper water column is likely to be directly (e.g., through smothering and ingestion) and indirectly (e.g., toxicity from decrease in water quality and bioaccumulation) affected by dissolved, entrained and floating hydrocarbons.		Plankton are found in the water column, not on the shoreline. Therefore,

Instantaneous in-water hydrocarbon exposure may impair ecosystem functioning during an upwelling event where significant krill aggregations and resultant feeding fauna may ingest in-water hydrocarbons. This is relevant to the KEFs of the Bonney Coast Upwelling and the Upwelling East of Eden. There is potential for chronic-level exposure to juvenile fish, larvae and planktonic organisms and follow-on repercussions to top order predators, including seabirds and marine mammals, from ingesting krill within exposed KEFs and this is assessed in Tables 7-35 and 7-36. Once background water quality conditions are re-established following natural weathering and dispersion of hydrocarbons, plankton populations are expected to recover rapidly due to recruitment of plankton from surrounding waters and reproduction by survivors. Thus, consequence on plankton populations from exposure to moderate threshold hydrocarbons is **Minor**.	there is no exposure pathway expected.

Summary of predicted impact level to plankton	Risk rating
A LOWC condensate release has the potential to result in: • Fauna injury/mortality The extent of the area of impact is predicted to be limited to photic portions of the water column (i.e. up to 30 m depth) due to the expected higher concentration of plankton within this area and nature of condensate in the marine environment. The consequence of LOWC condensate release associated with plankton injury/mortality has been assessed as **Minor (2)**, based on: • Phytoplankton may be impacted by limited photosynthetic (growth) capacity as a result of direct smothering or limited ability for light to penetrate the water column. While zooplankton may be impacted by toxicity through direct contact (ingestion, inhalation and dermal contact) resulting in injury or mortality. • Plankton exhibit rapid recovery due to mass spawning behaviours of many species with planktonic life phase, along with ocean current facilitating migration from unaffected areas. It is expected that plankton communities will recovery over weeks to months once background water quality conditions have re-established. • Although short-term changes to plankton levels may occur, conservation values of protected areas are not expected to be affected in response to predicted impacts of LOWC release on plankton including at Apollo AMP, Beagle AMP, Boags AMP, Franklin AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF, Big Horseshoe Canyon KEF or Upwelling East of Eden KEF. • The magnitude of potential risk associated with a LOWC condensate release is considered to result in short-term and localised impacts, representing a small portion of the plankton population that is widely representative of the region, with no population level impact or impact to dependent species expected. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. If an incident occurred, it would be restricted to upper water column within the photic zone (up to 30 m depth) and would be unlikely to impede the recovery of a plankton and associated food chains within the South-East bioregion.	**<u>Plankton</u>** **Low (RR I)**

Table 7-32: Potential risk of LOWC condensate release on marine invertebrates

General sensitivity to oiling – marine invertebrates (Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421)		
Sensitivity rating of marine invertebrates		**Low**
A description of marine invertebrates in the EMBA is provided in:		Section 4.6.4
Refer to Table 7-19 (in Section 7.6) for details on general sensitivity of marine invertebrates to oiling.		
Potential consequence from LOWC condensate release		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Adult marine invertebrates and larvae usually reside within benthic substrates and pelagic waters, rarely reaching the water's surface in their life cycle, and are unlikely to be exposed except at locations where surface oil reaches shorelines. Refer to shoreline exposure for further description of potential risks.	Adult marine invertebrates and larvae usually reside within benthic substrates and pelagic waters. Modelling predicts impact associated with moderate dissolved and entrained hydrocarbon exposure is limited to shallow waters and, therefore, invertebrate benthic habitats < 30 m deep. High exposure thresholds for in-water (dissolved) hydrocarbons are predicted 100% probability at Colac Otway and Corangamite nearshore waters. Dissolved hydrocarbon exposure at moderate thresholds is predicted at 100% at Twelve Apostles, Colac Otway near shore waters (98%) and Corangamite nearshore waters (98%), followed by King Island nearshore waters (62%). Marine invertebrates within these nearshore water areas may be impacted by in-water hydrocarbon exposure, with the potential of chronic effects to occur. Instantaneous in-water hydrocarbon exposure to Shelf rocky reefs KEF may have chronic ecological effects on fauna inhabitants of the rocky reefs, macroalgae and sessile invertebrates. Chronic effects to reef habitats and fauna, macroalgae and sessile invertebrates are unlikely given both the instantaneous nature of the exposure and low probability of occurrence at depths where flora and fauna coverage occurs. Due to the physical properties of the hydrocarbons and the well- mixed nature of the waters of the EMBA, coating of invertebrates and prolonged exposure to hydrocarbons is considered highly unlikely. Thus, the consequence to invertebrate communities from exposure to high and moderate threshold dissolved and entrained hydrocarbons is **Minor**.	Invertebrates are expected to be most exposed to shoreline hydrocarbon exposure, where surface oil reaches shorelines. High threshold shoreline loading is predicted at King Island (80%) Moyne (16%). Lady Julia Percy Island (9%), Warrnambool (2%), and Glenelg (2%). Moderate shoreline loading is predicted to the occur at multiple receptors, including several islands and island groups. Due to the physical properties of the weathered hydrocarbons expected to wash up on shorelines and exposed nature of these shorelines, coating of invertebrates and prolonged exposure to hydrocarbons is considered highly unlikely. Thus, the consequence to invertebrate communities from exposure to high and moderate threshold hydrocarbons at the shoreline is **Minor**.

Summary of predicted impact level to marine invertebrates	Risk rating
A LOWC condensate release has the potential to result in: • Change in fauna behaviour • Injury/mortality to fauna The extent of the area of impact is predicted to be limited to shallow benthic habitats and areas of shoreline exposure. The consequence of a LOWC condensate release injury/mortality or change in behaviour of individual invertebrates has been assessed as **Minor (2)**, based on: • Limited exposure to large quantities of unweathered hydrocarbons, as such less opportunity for smothering or toxicity impacts due to distance from Operational Area to shallow habitat and shorelines. • Planktonic phase of invertebrates, although expected to be more vulnerable than adult phase to presence of in-water hydrocarbon exposure, are expected to exhibit rapid recovery rate due to mass spawning behaviours of many species, along with ocean current facilitating migration from unaffected areas. Whereby it is expected that plankton communities will establish over weeks to months once background water quality conditions have re-established. As such any impact on larval phased is expected to be localised and of short duration. • The magnitude of potential risk associated with an LOWC condensate release is considered to result in medium-term impacts on a small portion of the invertebrate population (in shallow waters), with no population level impact expected. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. If an incident occurred, it would be restricted to invertebrate habitats in shallower water and shoreline and would be unlikely to impede the recovery of invertebrates and associated food chains within the South-East bioregion.	**Marine Invertebrates** **Low (RR I)**

Table 7-33: Potential risk of LOWC condensate release on fish

General sensitivity to oiling - fish	
Sensitivity rating of fish	**Low**
A description of fish in the EMBA is provided in:	Section 4.6.5
Refer to Table 7-20 (in Section 7.6) for details on general sensitivity of fish to oiling. **White Shark (EPBC Listed: Vulnerable, Migratory, Marine)** White shark distribution BIA, foraging BIA and breeding BIA overlaps low, moderate and high surface (floating) and in-water thresholds. **Eastern School Shark (EPBC Listed: Conservation Dependent)** Eastern School Shark occurs throughout the temperate coastal waters of Southern Australia. Females and juveniles utilise the inshore coastal areas around Victoria, Tasmania and parts of South Australia for nursery areas. It was identified to may overlap with the low and moderate surface (floating) and in-water thresholds.	

Little Gulper Shark (EPBC Listed: Conservation Dependent)

Little Gulper Shark identified as likely to overlap with the low and moderate surface (floating) and in-water thresholds.

Harrison's Dogfish Shark (EPBC Listed: Conservation Dependent)

Harrison's Dogfish identified as likely to overlap only with the low surface (floating) and in-water thresholds.

Southern Dogfish Shark (EPBC Listed: Conservation Dependent)

Southern Dogfish identified as likely to overlap only with the low surface (floating) and in-water thresholds.

Grey Nurse Shark (EPBC Listed: Critically Endangered)

Grey Nurse Shark known to occur in areas overlapped by only the low surface (floating) and in-water thresholds.

Maugean Skate (EPBC Listed: Endangered)

The last known viable population of Maugean skate occurs within Macquarie harbour (DCCEEW 2023). The majority of Macquarie Harbour is overlapped by the low threshold EMBA (Figure 4-6 in the EP). The low threshold represents sub-lethal concentrations of hydrocarbons and are not predicted to result in ecological effects (Figure 4-6 in the EP). The moderate threshold LOWC EMBA overlaps the lower estuary of Macquarie Harbour only (Figure 4-6 in the EP. [Section updated in response to Matter: S18].

Australian Grayling (EPBC Listed: Vulnerable, Migratory)

The Australian Grayling is endemic to south-eastern Australia, including Victoria, Tasmania and New South Wales, and is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, and freshwater rivers and streams as adults. The National Recovery Plan for this species identifies several rivers in the following bioregions which overlap with the low in-water exposure thresholds as important habitats:

- South East Corner, Victoria
- South East Coastal Plain, Victoria
- Tasmanian West, Tasmania
- King Island, Tasmania

Blue Warehou (EPBC Listed: Conservation Dependant)

Blue Warehou are a bentho-pelagic species that inhabits continental shelf and slope waters, usually aggregating close to the seabed. The species was identified as likely to overlap with the low, moderate and high surface (floating) and in-water thresholds.

Southern Bluefin Tuna (EPBC Listed: Conservation Dependent)

Southern Bluefin Tuna is a highly migratory pelagic species found in the eastern Indian Ocean and the south-west Pacific. The species was identified as likely to overlap with the low, moderate and high surface (floating) and in-water thresholds.

Eastern Dwarf Galaxias (EPBC Listed: Vulnerable)

Eastern Dwarf Galaxias is a small freshwater species endemic to south eastern Australia, found in waterways and wetlands fragmented across Victoria, Tasmania and South Australia. The distribution was identified as likely to overlap with low, moderate and high surface (floating) in-water thresholds.

Yarra Pygmy Perch (EPBC Listed: Endangered)

Yarra Pygmy Perch is only found in limited areas of south eastern Australia, between West Gippsland, Victoria, and south-eastern South Australia. The species distribution is known to overlap with low, moderate and high surface (floating) in-water thresholds.

Deep Orange Roughy (EPBC Listed: Conservation Dependent)

Deep Orange Roughy is a deep-sea demersal species, occurring from NSW to south western Australia. They can inhabit seamounts and ridges south of Australia. It was identified as likely to overlap with the low, moderate and high surface (floating) in-water thresholds.

Eastern Gemfish (EPBC Listed: Conservation Dependent)

Eastern Gemfish are found throughout Australian eastern temperate waters, including Tasmania, and was identified as likely to overlap with only the low, moderate and high surface (floating) in-water thresholds.

Red Handfish (EPBC Listed: Conservation Dependent)

Red Handfish may overlap with only the low surface (floating) and in-water thresholds.

Spotted Handfish (EPBC Listed: Critically Endangered)

Spotted Handfish may overlap with only the low surface (floating) and in-water thresholds.

Ziebell's Handfish (EPBC Listed: Vulnerable)

Zeibell's Handfish identified as likely to overlap with only the low surface (floating) and in-water thresholds.

Variegated Pygmy Perch EPBC Listed: Vulnerable)

Variegated Pygmy Perch known to occur within areas that overlap with the low surface (floating) and in-water thresholds.

Black Rockcod (EPBC Listed: Vulnerable)

Black Rodcod identified as likely to overlap only with the low surface (floating) and in-water thresholds.

Potential consequence from LOWC condensate release		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Moderate and high threshold exposure MDO is predicted at the sea surface. Fish species in the water column and syngnathid species associated with rafts of floating seaweed may come into contact with surface oil. The maximum distance of moderate exposure threshold from the release site (representing the point at which harmful effects may be encountered) represents a small area of the sea surface in comparison to the wider Bass Strait. Further analysis of the spill data showed no surface (floating) hydrocarbons at any modelled threshold within or in close proximity to Macquarie Harbour, the last known refuge for	There is 100% probability of high exposure thresholds for in-water (dissolved) and in-water (entrained) hydrocarbons at Apollo AMP, Zeehan AMP, King Island IBRA, Otway IMCRA, Central Bass Strait IMCRA, Warrnambool Plain, Colac Otway NS waters, Corangamite NS waters, Twelve Apostle MNP, Braveness Rock RSB and Tasmanian state waters, and 100% probability of in-water (entrained) hydrocarbons at West Tasmanian Canyon KEF. This threshold of exposure represents the possibility of sublethal impacts to chronically exposed fish species. However, NOAA (2013) and ITOPF (2011a) state that hydrocarbon spills in open water are so rapidly diluted that fish kills are rarely observed. Fish such as the white shark, shortfin mako and porbeagle shark spend most of their time in the water column. As highly mobile species, they are unlikely to remain in one area for a long period of time, which minimises the risk that they	Since fish and sharks do not generally break the sea surface, surface hydrocarbon impacts to fish and shark species are unlikely to occur.

the Maugean skate. [Paragraph added in response to Matter: S18]. However, the majority of fish species tend to remain in the mid-pelagic zone and are not likely to come into contact with floating hydrocarbons on the sea surface. Due to this reduced likelihood of exposure for the majority of fish species present in the EMBA, the consequence of LOWC condensate release on the sea surface to fish is **Minor**.	would be exposed to toxic levels of hydrocarbons for the length of time necessary to impart a lethal impact. Modelling showed no dissolved condensate at moderate thresholds which are predicted to result in ecological effects within Macquarie Harbour, the last known refuge of the Maugean skate. Laboratory studies have shown that dissolved hydrocarbons exert most of the toxic effects of oil on aquatic biota (Carls et al. 2008; Nordtug et al. 2011; Redman 2015). Only entrained hydrocarbons were modelled to be within the lower reaches of Macquarie Harbour above low thresholds. Entrained hydrocarbons consist of droplets that are suspended in the water column and are insoluble. Insoluble compounds in oil cannot be absorbed from the water column by aquatic organisms, therefore they are not bioavailable through absorption of compounds from water. [Paragraph added in response to Matter: S18]. Predicted high exposure thresholds within the West Tasmanian Canyon KEF may have chronic ecological effects on pelagic species found in the canyons. Given that the release occurs within the generally well-mixed waters of the Bass Strait and, along with the high and rapid rate of weathering, the consequence of a LOWC condensate release to fish in the water column is **Minor**.	

Summary of predicted impact level to fish	Risk rating
A LOWC condensate release has the potential to result in: • Change in fauna behaviour • Injury/mortality to fauna The extent of the area of impact is predicted to be limited to in-water exposure of fish in the upper water column (30 m depth). The consequence of a LOWC condensate release on injury/mortality or change in behaviour of individual fish has been assessed as **Minor (2)**, based on: • Risk of direct contact, ingestion or inhalation is largely determined by behaviours and habitat preferences of fish species. Those at greatest risk of such impacts display limited mobility or high site fidelity. Pelagic fish are most likely to interact with unweathered hydrocarbons, but are highly mobile and are unlikely to remain in the area for long enough to be exposed to sub-lethal doses. • Fish are able to detect and avoid contact with surface slicks, reducing the likelihood of mass fish mortalities in the event of a hydrocarbon spill in open waters. • Fish species that are abundant, short-lived and highly fecund are expected to recover rapidly. However less abundant, long-lived species may take longer to recover.	**Fish** **Low (RR I)**

• Planktonic life phases, though more susceptible to toxicity effect, tend to exhibit rapid recovery due to mass spawning behaviours of many species and ocean current facilitating migration from unaffected areas. It is expected that plankton communities will establish over weeks to months once background water quality conditions have re-established (see 'Plankton' assessment, Table 7-18).
• The Recovery Plans for species identified as present in the EMBA do not explicitly identify 'oil spill', as a key threat. However, they do make relevant references including the following:
  o National Recovery Plan for the Australian Grayling (*Prototroctes maraena*) identifies poor water quality as a threatening process and a source of habitat degradation. Specific river systems have been identified as important habitat for long term survival within NSW, Victoria and Tasmania and several rivers overlap low in-water exposure thresholds.
  o National Recovery Plan for the Yarra Pygmy Perch (*Nannoperca obscura*) identified reduction in riparian vegetation quality, and subsequent water quality, as a process leading to degradation and loss of habitat for the species.
  o National Recovery Plan for the Variegated Pygmy Perch (*Nannoperca variegata*) identified reduction in riparian vegetation quality, and subsequent water quality, as a process leading to degradation and loss of habitat for the species.
  o National Recovery Plan for the Dwarf Galaxias (*Galaxiella pusilla*) identified reduction in riparian vegetation quality, and subsequent water quality, as a process leading to degradation and loss of habitat for the species.
  o Recovery Plan for the White Shark (*Carcharodon carcharias*) identifies habitat degradation (e.g. through pollution) as a threat.
  o Recovery plan for the Grey Nurse Shark (*Carcharius taurus*) identifies pollution as a potential threat.
• The white shark has a low occurrence distribution BIA that overlaps the EMBA, although this extends to all EEZ waters adjacent to their coastal distribution in Australia. White shark presence is expected to be largely transitory or short term in nature.
• It also has a foraging and breeding BIA which overlaps the EMBA. The breeding BIA is a nursery area where juveniles are known to aggregate seasonally between Corner Inlet and Ninety Mine Beach, east coast of Victoria. The foraging BIAs are located around coastal and island locations throughout the EMBA, typically associated with fur seal and Australian sea lion colonies. Australian fur-seal colonies known to occur within the LOWC (low) EMBA include Lady Julia Percy Island (Vic), Reid Rocks (Tas) and Seal Rocks (Vic) (Shaughnessy 1999). New Zealand fur-seal colonies occur at Cape Bridgewater (Vic), Lady Julia Percy Island (Vic), Kanowna Island (Vic) and Maatsuyker Island (Tas) (Kirkwood et al. 2009)
• West Tasmanian Canyon KEF represents an area of high productivity which supports fish nurseries (blue warehou and ocean perch) and foraging white shark. Exposure to hydrocarbons at high thresholds within this KEF would affect primary productivity (refer to 'plankton' assessment, Table 7-18) with subsequent impacts to fish nursery and foraging.
• Both the Bonney Coast Upwelling and the Upwelling East of Eden KEFs represents an area of high productivity which supports large aggregations of marine life, including pelagic fish and foraging areas for sharks. Exposure to hydrocarbons at high thresholds within these KEFs would affect primary productivity (refer to 'plankton' assessment, Table 7-18) with subsequent impacts to fish nursery and foraging.
• Conservation values of protected areas are not expected to be affected in response to predicted impacts of a LOWC release on fish, including at Apollo AMP, Beagle AMP, Boags AMP, Franklin AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, Big Horseshoe Canyon KEF or Upwelling East of Eden KEF.	

• A LOWC condensate release is considered to result in short-term (days to months) and localized impacts on a small portion of the fish population that is widely represented in the region and a small portion of the total BIA for species identified, with no population level impact expected. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. If an incident occurred, it impacts would largely be restricted to upper water column and coastal areas and are expected to be restricted to individual fauna and unlikely to impede the recovery of a protected species or any associated food chains within the South-East bioregion.	

Table 7-34: Potential risk of LOWC condensate release on birds

General sensitivity to oiling - birds	
Sensitivity rating of seabirds	**Medium**
Sensitivity rating of shorebirds	**High**
Sensitivity of aquatic birds	**High**
A description of birds in the EMBA is provided in:	Section 4.6.7
Refer Table 7-21 (in Section 7.6) for details on general sensitivity of birds to oiling.	

Potential consequence from LOWC condensate release		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Seabirds When first released, condensate has higher toxicity due to the presence of volatile components. Individual birds making contact close to the spill source at the time of the spill (i.e. areas of concentrations >10 g/m^2 out to 42.7 km from the release location) may be impacted. Many birds will be affected as volatile surface hydrocarbons are expected to be present over 90 days during a LOWC event. Seabirds rafting, resting, diving or feeding at sea have the potential to encounter areas where surface hydrocarbons concentrations are greater than 10 g/m^2 and due to physical oiling may experience lethal surface concentrations. As such, acute or chronic toxicity impacts (death or long-term poor health) to birds is possible during a LOWC event. Contact with areas of high hydrocarbon exposure is highly unlikely (i.e. areas of concentrations >25 g/m^2 limited to immediate release location). As such, acute	**Seabirds** The zones of dissolved hydrocarbons at moderate threshold and entrained hydrocarbons at high threshold are relatively small in comparison to the Bass Strait and Otway region. It is these small areas where sub-lethal or toxic effects to birds may occur. There is a low probability that seabirds would be feeding exclusively or predominantly on fish found in areas of higher hydrocarbon thresholds, meaning there is low probability of seabirds themselves experiencing sub-lethal or toxic impacts as a result of consuming hydrocarbon-tainted fish. Therefore, the consequence to seabirds is **Minor.** **Shorebirds** Shorebird presence in the offshore environment is largest transitory, therefore the consequence of surface oiling to shorebirds is **Minor**.	**Seabirds** Most of the seabird species described in Section 4.6.7 that may occur in the spill EMBA forage over an extensive area and are distributed over a wide geographic range. Seabird interactions with shorelines is expected to be largely during periods of rest and breeding activities. Species such as Albatrosses and Giant-petrels seldom come to land unless breeding. Resident seabirds are expected to spend greater periods of time on shorelines associated with burrows on sloping ground in coastal forest, scrubland, shrubland or grassland. Threatened, migratory and/or listed marine species have the potential to be foraging or breeding within the area predicted to be contacted by >100 g/m^2 shoreline hydrocarbon exposure. The largest length of actionable shoreline oil (defined as >100 g/m^2) is predicted to reach up to 76 km. Predicted peak volume ashore of 318.9 m^3 was estimated during winter. King Island, and to lesser extents Moyne, Lady Julia Percy Island, Warrnambool and Glenelg are predicted to be exposed by shoreline hydrocarbons >1000 g/m^2. The black-faced cormorant breeding BIA at Christmas Island, part of King Island IBA, may be impacted by the high threshold shoreline loading. The short-tailed shearwater breeding BIAs at Christmas Island New Years Island, Cape Farewell, Cape Wickham, Cape Wickham Lighthouse,

or chronic toxicity impacts (death or long-term poor health) to small numbers of birds may occur. Therefore, the consequence to seabirds is **Major**. **Shorebirds** Shorebird presence in the offshore environment is largest transitory, therefore the consequence of surface oiling to shorebirds is **Minor**. **Aquatic Birds** As characteristic of aquatic birds, little penguin forage while swimming and often forage for extended periods of time (dawn to dusk) and may forage up to 50 km from the colony. As such little penguin are most at risk of direct contact, ingestion or inhalation while feeding at sea. Little penguins are most likely to encounter low concentrations of hydrocarbons due to its broader extent compared to moderate and high concentrations. The low threshold level of exposure is not expected to result in the lethal impacts of feather matting and hypothermia. The high threshold is expected to impart toxicity and ecological impacts. The consequence to aquatic seabirds is **Moderate**.	**Aquatic Birds** There is a low probability that aquatic birds would be feeding exclusively or predominantly on fish found in areas of higher hydrocarbon thresholds, meaning there is low probability of aquatic birds themselves experiencing sub-lethal or toxic impacts as a result of consuming hydrocarbon-tainted fish. The proximity of the little penguin BIA on Christmas Island and foraging behaviours involving extended periods of time at sea, means that the potential direct exposure of these birds to hydrocarbons is greater than for other species. Therefore, the consequence to aquatic birds is **Moderate.**	Seal Rocks, and Badger Box Creek, all a part of the King Island IBA, between October-May, may be impacted by the high threshold shoreline loading. The common diving-petrel breeding BIA at Lady Julia Percy Island, between July-January, may be impacted by the high threshold shoreline loading. The wedge-tailed shearwater breeding BIA at Muttonbird Island, Victoria (August to May) occurs near to Colac Otway moderate threshold shoreline loading. Given the area of accumulation and exposure nature of these shoreline the consequence to seabirds is **Moderate**. **Shorebirds** Shoreline species may suffer both direct oiling and potential displacement from foraging and nesting sites. Acute or chronic toxicity impacts (death or long-term poor health) to birds is possible. Shorebird species (e.g., plovers, godwits, curlews, etc.) prefer varying habitats including tidal flats, open saltmarsh, freshwater wetlands, open grasslands and sandy beaches. Coastlines potentially exposed to high threshold shoreline loading are rocky and located on the Cape Otway coast, King Island, Moyne, Lady Julia Percy Island (9%), Warrnambool (2%), and Glenelg (2%). Moderate shoreline loading is predicted to the occur at multiple receptors, including several islands and island groups. The King Island coastline is a recognised IBA which supports hooded plovers and includes Lavinia State Reserve (not intersected by shoreline loading), which supports orange-bellied parrots and endemic subspecies of bush birds. The Port Fairy to Warrnambool coastline is a recognised IBA which supports a breeding population of hooded plovers and is an over wintering site for the orange-bellied parrot. The coastline of the Great Otway National Park between Torquay and Princetown is a recognised IBA, Otway Range, which supports fifty-nine rare or threatened bird species, including shy albatross, wandering albatross, swift parrot, southern giant-petrel and fairy prion.

		Other IBAs with the potential to be intersected by moderate shoreline loading include Lawrence Rocks and the Wilsons Promontory. Both IBAs support a variety of EPBC listed shorebird species. Direct oiling of nesting sites is considered unlikely as hydrocarbon would typically accrue within the upper swash zone, and nests would occur above this level on a beach. However, oiled fauna may track oil into their nests, which may then have subsequent impacts on any eggs present. This would be more of a risk for fauna, such as the little penguin, that have to traverse the intertidal area to reach nesting sites. Given the potential for sensitive shoreline habitat to be exposed to hydrocarbons above the actionable >100 g/m^2 shoreline exposure thresholds, the length of shoreline that has the potential to be exposed and the peak volume potentially accumulated ashore, the consequence has been ranked as **Major**. **Aquatic Birds** Little penguins are largely sedentary, returning to the colony when not at sea, with multiple breeding BIAs identified throughout the Bass Strait. These habitats are largely not contacted by the moderate threshold hydrocarbons. Rather, coastlines potentially exposed to moderate threshold shoreline loading are rocky and located on the Cape Otway coast, the south west and south east coast of King Island and on islands off the west coast of Wilsons Promontory. The King Island coastline is a recognised IBA which include a breeding BIA at Christmas Island. Due to the proximity of the BIA on Christmas Island and isolated areas of potential moderate shoreline loading, the consequence of an LOWC spill to aquatic bird species is **Moderate**.

Summary of predicted impact level to birds	Risk rating

A LOWC condensate release has the potential to result in:
• Change in fauna behaviour
• Injury/mortality to fauna
The extent of the area of impact is predicted to be limited to moderate threshold of surface (floating) hydrocarbon and in-water exposure in the upper water column (0-10 m depth). The worst-case consequence of a LOWC condensate release on injury/mortality or change in behaviour for birds has been assessed as **Major (4)**, based on:
• Risk of direct contact, ingestion or inhalation amongst bird species is largely determined by behaviours and habitat preferences. With those at greatest risk displaying behaviours and characteristics causing greater opportunity for exposure including:
  o Proportion of the time spent at the sea surface, increasing the opportunity for direct exposure, inhalation or ingestion (i.e. Seabird species that raft together in large flocks and / or plunge dive, and aquatic birds which forage at sea for extended periods of time)
  o Occurrence of biologically important behaviours (i.e. breeding or feeding may override any tendency to avoid hydrocarbons)
  o Species feeding habits (i.e. seabird plunge diving, aquatic bird in water feeding, shorebird intertidal foraging)
  o Breeding locations (i.e. preference for nest location in low lying coastal area)
• Flying birds are highly mobile and able to avoid noxious presence of hydrocarbons, as such general it is very unlikely to be constantly exposed to concentrations of hydrocarbons that would lead to chronic toxicity effects. Aquatic birds though also highly mobile are less able to avoid in-water exposures.
• Breeding colonies on low lying coastal areas (i.e. aquatic birds, shorebirds and seabirds) are likely to have greater exposure and sensitivity to hydrocarbon spills. For example, bird eggs may be damaged if a contaminated adult sits on the nest.
• Lavinia, Corner Inlet and Glenelg Estuary and Discovery Bay Listed RAMSAR wetland is exposed to high in-water (entrained and dissolved) exposure thresholds, which could result in ecological impacts to habitat function.
• King Island (recognised IBA) has predicted shoreline accumulation of hydrocarbons at the moderate threshold (100% probability) and at high thresholds (80% probability) of shoreline affected.
• Port Fairy to Warrnambool coastline (recognised IBA) has predicted shoreline accumulation of hydrocarbons at the moderate threshold (88% probability) and to a much lesser extent at the high thresholds (2%) of shoreline affected.
• Preening behaviours of birds also presents increased risk of ingested when exposed to hydrocarbons at sea (i.e. seabirds and aquatic birds).
• Listed Critical Habitat at Albatross Island (Tasmania) occurs within low threshold for in-water (entrained) exposure. The island represents one of four major breeding locations under Australian jurisdiction for shy albatross, wandering albatross and grey-headed albatross species.
• Marine pollution / oil spill is identified as a key threat in Recovery Plans for species present in the EMBA, including:
	Seabirds
	Medium (RR II)
	
	Shore birds
	Medium (RR II)
	
	Aquatic birds
	Medium (RR II)

○ Conservation Advice *Sternula nereis nereis* (Fairy Tern) identifies environmental pollution as a potential threat, particularly in Victoria, where the close proximity of oil facilities poses a risk of oil spills that may affect the species' breeding habitat. Subspecies breeds in October to February in Australia. Moderate exposure threshold for MDO spill scenario does not overlap with Fairy Tern breeding BIAs, however Conservation Advice identified the following location as having notable occurrence within Victoria Corangamite; East Gippsland; West Gippsland; and Port Phillip and Western Port. ○ Conservation Advice *Calidris canutus* (Red Knot) identifies environmental pollution as a potential threat due to potential impacts on habitat loss and habitat degradation. Oil spills are identified as a source of direct morality, with pollution/contamination identified as a having potential to adversely affected migratory shorebirds, both on passage and in non-breeding areas. ○ Conservation Advice *Calidris ferruginea* (Curlew Sandpiper) identifies environmental pollution as a potential threat due to potential impacts on habitat loss and habitat degradation, of particular concern around settled areas which may have reduced the availability of food, and at migratory staging sites. The key staging site for this occur outside of the EMBA. ○ Conservation Advice for *Numenius madagascariensis* (Eastern Curlew) identifies environmental pollution as a potential threat due to potential impacts on habitat loss and habitat degradation, of particular concern around settled areas which may have reduced the availability of food, and at migratory staging sites. Migratory arrivals are expected in southern Tasmania mostly around late August to early October, with later arrivals, probably of juveniles, not until December. ○ Conservation Advice *Thinornis rubricollis rubricollis* (hooded plover Eastern) identifies environmental pollution as a potential threat. ○ Wildlife Conservation Plan for Seabirds identifies acute pollution such as oil spill as a direct and moderate threat to seabirds. ○ Gould's Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan refers to oil spills, stating that oceanic oil spills may pose some risk given oceanic feeding habits. ○ National Recovery Plan for albatross and petrels (2022) identifies marine pollution as a potential threat to long term survival. ○ Wildlife Conservation Plan for Migratory Shorebirds identifies acute pollution such as oil spill is as a moderate threat due to potential impact on important habitat for many years through catastrophic loss of marine benthic food sources. • The presence of species identified with BIAs overlapping the EMBA is expected to be largely transitory or short term in nature. Seabird BIAs which intersect the EMBA are discussed in Section 4.6.7 and presented in Table 4-11. • Conservation values of protected areas, including those associated with birds, are not expected to be affected in response to predicted impacts of a LOWC release including at Apollo AMP, Beagle AMP, Boags AMP, Franklin AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF, Big Horseshoe Canyon KEF or Upwelling East of Eden KEF. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. If an incident occurred, its impacts would largely be restricted to upper water column and coastal areas.	

Table 7-35: Potential risk of LOWC condensate release on marine mammals

General sensitivity to oiling – marine mammals	
Sensitivity rating for cetacean	**Medium**
Sensitivity rating for pinnipeds	**High**
A description of marine mammals in the EMBA is provided in:	Section 4.6.9

Refer to Table 7-22 (in Section 7.6) for details on general sensitivity of marine mammals to oiling.

Pygmy Blue Whale (EPBC Act: Endangered, Migratory):

Pygmy Blue Whale foraging area (annual high use) BIA, known foraging area BIA and distribution BIA overlap low and moderate surface and low, moderate and high in-water thresholds.

Southern Right Whale (EPBC Act: Endangered, Migratory):

The SRW migration BIA and reproduction BIA overlap the low, moderate and high surface water thresholds (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467). The SRW migration BIA overlaps the low, moderate and high in-water thresholds. The species are regularly present on the Australian coast between early-April to early November with isolated individuals seen outside these periods (DSEWPaC 2012c). Note the eastern population is recovering at a slower rate to the western population and, although both populations show signs of increase in abundance, current abundance levels remain very low compared to pre-exploitation numbers (Carroll et al. 2014, Stamation et al. 2020). Less than 10% of the Australian SRWs are distributed east of Adelaide (in eastern SA, TAS, Vic and NSW) and may represent a separate population.

Sei Whale (EPBC Act: Vulnerable, Migratory):

No BIAs overlap LOWC condensate release thresholds. This species is infrequently recorded off Tasmania and offshore of the continental shelf in the Bonney upwelling (Gill et al. 2015; TSSC 2015e), with no known mating or calving areas in Australian waters (TSSC 2015e).

Fin Whale (EPBC Act: Vulnerable, Migratory):

No BIAs overlap LOWC condensate release thresholds. The species is known to feed in the Bonney Upwelling during summer/autumn (DAWE, 2020d). Areas of upwelling and interfaces with mixed and stratified waters may be an important feature of fin whale feeding habitat.

Humpback Whale (EPBC Act: Vulnerable, Migratory):

Moderate in-water threshold overlaps humpback whale migration BIA. The nearest area that humpback whales are known to congregate and potentially forage is approximately 630 km north-east of the Operational Area at Twofold Bay, Eden off the New South Wales south coast. However, humpback whales are reported to migrate through Tasmanian waters. A study conducted by Andrews-Goff et al (2018) highlights the unlikeliness of the western coast of Tasmania and western Bass Strait to be frequently utilised for humpback whale migration.

Pinnipeds:

The foraging BIA for the Australia Sea Lion was identified to occur within the low, moderate and high threshold EMBA. Small breeding colonies of the Australia Sea Lion occur on islands or remote sections of coastline between Western Australia and South Australia. Known breeding colonies for Australian fur-seals are on islands off the coast; Kanowna Island, Rag Island, West Moncoeur Island, Lady Julia Percy Island and Seal Rocks (Vic). Cape Bridgewater is also a known haul out site. Seal Rocks on King Island is also a New Zealand fur-seal breeding colony.

Potential consequence from LOWC condensate release		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Cetaceans Spill modelling predicts that low, moderate and high zones of exposure to sea surface hydrocarbon will overlap BIAs for several listed cetacean species, including pygmy blue whale (PBW), southern right whale and humpback whale. If whales are foraging at the time of the spill, a greater number of individuals may be present in the area where sea surface oil is present. The area exposed by moderate levels of surface hydrocarbons (76 km from the release location) is relatively small compared to the overall distribution area of cetaceans. Contact with areas of high hydrocarbon exposure is highly unlikely (i.e. areas of concentrations >25 g/m^2 limited to immediate release location). Given this is a relatively small area of the total foraging BIA for pygmy blue whales and migration BIA for southern right whales, the risk of displacement to whales is considered low. There is potential for interaction with southern right whales given the activity window overlaps with the northern migration period of May-June, the peak breeding (July-August) and southern migration period (September-November) (Section 4.6.9.2). The activity timing overlaps with the blue whale season for migration and foraging in the EMBA. Visual and acoustic surveys suggest that blue whales are present in the Otway region between November to June, peaking in February and March (Section 4.6.9.2). There is no population estimate for blue whales globally or in Australia and they are EPBC listed as endangered and migratory. Blue whales are highly mobile and widespread across the world's oceans. Aerial surveys in the Otway region recorded mean blue whale group size of 1.3±0.6 per sighting with cow-calf pairs observed in 2.5% of the sightings (Gill et al. 2011). However, acknowledging there is scientific uncertainty with specific whale numbers within the EMBA, it is expected that foraging whales would be present in the area. As such in a potential LOWC event, hydrocarbon exposure could possibly affect aggregations of blue or other foraging whale species. Consequently, the potential consequence to cetaceans are considered to be **Major**, as they could be expected to result in major environmental impact,	**Cetaceans** Stochastic spill modelling shows the EMBA for dissolved and entrained phase hydrocarbons at the low and moderate threshold through Bass Strait and the Otway region. At the low threshold, water quality triggers may be exceeded, but there are no toxicity or ecological effects to cetaceans. The maximum distance (km) from release location of dissolved hydrocarbons at high threshold is 452 km, and of entrained hydrocarbons at high threshold is 699 km. It is unlikely that highly mobile and transient species such as cetaceans moving through deep water, through a geographically and temporally limited area of entrained or dissolved hydrocarbons at moderate or high exposure, would experience any toxicity effects of the condensate release and population level impacts would be unlikely. The well-mixed waters of central Bass Strait are likely to assist in weathering of hydrocarbons (RPS 2023). The possibility of short-term impacts to species of conservation value means the consequence to cetacean populations from a LOWC condensate release is **Moderate**. **Pinnipeds** Given that fur-seals forage for prey within the water column, exposure to hydrocarbons (either via ingestion of contaminated prey or direct contact with oil droplets) may occur. Hydrocarbons in the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds, however given	**Cetaceans** Given cetaceans marine existence, shoreline hydrocarbons are not applicable. **Pinnipeds** Exposure to weathered hydrocarbons at the low threshold is unlikely to have a biological or ecological impact. Moderate threshold hydrocarbons may contact shorelines used by fur-seals on the south coast of King Island and off the west coast of Wilsons Promontory. However, no contact is expected at known haul out and breeding locations in the region. Given the extent of moderate threshold exposure, the consequence of a LOWC condensate spill to multiple individuals and populations present in Bass Strait is **Minor**.

requiring significant mitigation measures to formally managed species/habitats of recognised conservation value. **Pinnipeds** The foraging range for New Zealand Fur-seals, Australian Sea-lions and Australian Fur-seals may be temporarily exposed to low, moderate and high concentration of hydrocarbons at the sea surface. As fur-seals forage for prey within the water column rather than at the sea surface, exposure to oil at the sea surface will only result when surfacing to breathe and resting at the surface. High concentrations are only predicted to reach Lady Julia Percy Island at relatively low probability, and potentially Seal Rocks, near King Island, both known breeding sites where fur seals are likely to be entering and exiting the water, therefore hydrocarbon exposure could possibly affect the breeding individuals in this location. High concentrations of hydrocarbon may overlap the foraging BIA of the Australia Sea Lion within South Australia and offshore waters. However, the probability of exposure is considered low. Depending on the duration of time spent at the sea surface, exposure may result in irritation to mucous membranes that surround the eyes and line the oral cavity, respiratory surfaces, and anal and urogenital orifices. The highly mobile nature of the pinniped means areas on the sea surface impacted by moderate and high hydrocarbon exposure can be avoided. Hydrocarbons in the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds, however given their widespread nature, no known breeding colony within the area of predicted ecological exposure (above time-based exposure concentrations), and the rapid loss of the volatile components of condensate in choppy and windy seas (such as that of the area exposed by moderate in-water hydrocarbon thresholds), the potential consequence to pinnipeds are considered to be **Moderate**, as they could be expected to result in localised minor short-term impacts to species of recognised conservation value.	their widespread nature, no known breeding colony within the area of predicted ecological exposure (above time-based exposure concentrations), and the rapid loss of the volatile components of condensate in choppy and windy seas (such as that of the area exposed by moderate in-water hydrocarbon thresholds), the potential consequence to pinnipeds are considered to be **Moderate**, as they could be expected to result in localised minor short-term impacts to species of recognised conservation value.	

Summary of predicted impact level to marine mammals	Risk rating
A LOWC condensate release has the potential to result in: • Change in fauna behaviour • Injury/mortality to fauna	**Cetaceans, Pinnipeds** **Medium (RR II)**

The worst-case consequence of condensate release on injury/mortality or change in behaviour has been assessed as **Moderate (3)** for pinnipeds and **Major (4)** for cetaceans, based on:
• Risk of direct contact, ingestion or inhalation amongst marine mammal species is largely determined by behaviours and habitat preferences. With those at greatest risk displaying behaviours and characteristics causing greater opportunity for exposure including:
  ○ Availability of rough surface for oil to adhere to (i.e. pinnipeds more susceptible than cetaceans)
  ○ Proportion of the time spent at the sea surface, creating increase opportunity for direct exposure, inhalation or ingestion (i.e. pinnipeds more susceptible than cetaceans due to inhalation requirements and resting (haul out) and breeding behaviours)
  ○ Occurrence of biologically important behaviours (i.e. breeding or feeding may override any tendency for marine mammals to avoid hydrocarbons)
  ○ Species feeding habits (i.e. baleen whales are not particularly susceptible to ingestion of oil in the water column, but are more susceptible to oil at the sea surface as they feed by skimming the surface)
• Marine mammals are highly mobile and able to avoid noxious presence of hydrocarbons, as such generally it is very unlikely for marine mammals to be exposed to concentrations of hydrocarbons for a duration that would lead to chronic toxicity effects.
• Pinniped breeding colonies are likely to have greater exposure and sensitivity to hydrocarbon spills. Hydrocarbon contaminated pups may not be recognisable to their mothers and present an increased risk that mothers may inject oil when cleaning oiled pups.
• The Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) specifies pollution, including oils spills, as a threat and a factor which may be contributing to a lack of recovery of the species.
• Marine pollution/habitat impacts are identified as key threats in Recovery Plans for species present in the EMBA including:
  ○ Conservation Management Plan for the Blue Whale identifies habitat modification as a threat, with no explicit relevant objectives or management actions.
  ○ Conservation Management Plan for the Southern Right Whale identifies habitat modification as a threat, with no explicit relevant objectives or management actions.
  ○ Conservation advice for *Balaenoptera borealis* (Sei Whale) identifies habitat degradation including pollution as a threat, with no explicit relevant objectives or management actions.
  ○ Conservation advice for Balaenoptera physalus (Fin Whale) identifies pollution (persistent toxic pollutants) as a threat, with no explicit relevant objectives or management actions.
  ○ Approved Conservation Advice for Megaptera novaeangliae (Humpback Whale) identifies habitat degradation including coastal development and port expansion as a threat, with no explicit relevant objectives or management actions.
• South-east Commonwealth Marine Reserves Network management plan 2013-23 identifies oil pollution associated with shipping, other vessels and offshore mining operations as a pressure on conservation values of the South-east to the Commonwealth Marine Reserves Network, however, provides no explicit relevant objectives or management actions.
• The presence of species identified with BIAs overlapping the EMBA is expected to be largely transitory or short term in nature. BIAs for the following intersect with the moderate in-water threshold:
  ○ PBW distribution:	

- High use foraging BIA represents seasonally high usage occurring between Cape Otway and Robe, in conjunction with seasonal Bonney Upwelling in summer/autumn months. - Foraging BIA represents a known foraging area which occurs north-west part of Bass Strait, from Cape Otway to Port Phillip Heads and to the south of King Island and extends to the majority of Bass Strait and the coastal waters of Tasmania. - Distribution BIA represent seasonally high usage of a large area that extends from southern NSW to Indonesia along whale seasonal migratory route. ○ Southern Right Whale (Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467) - Migration BIA represents open ocean and coastal waters around Tasmania, across the Bass Strait and west across Australia's southern coastline between April to October. - Reproduction BIA represents shallow coastal waters around Tasmania, the entire Victorian coastline, the southern NSW coastline between May to September. • Conservation values of protected areas, including those associated with cetaceans, are not expected to be affected in response to predicted impacts of a LOWC release including at Apollo AMP, Beagle AMP, Boags AMP, Franklin AMP, Zeehan AMP (Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386), Bonney Coast Upwelling KEF, West Tasmanian KEF, Big Horseshoe Canyon KEF or Upwelling East of Eden KEF. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. If an incident occurred, it impacts would largely be restricted to upper water column and coastal areas, and are expected to be restricted to individual fauna and unlikely to impede the recovery of a protected species.	

Table 7-36: Potential risk of LOWC condensate release on marine reptiles

General sensitivity to oiling – marine reptiles		
Sensitivity rating of marine reptiles	**Medium**	
A description of marine reptiles in the EMBA is provided in:	Section 4.6.8	
Refer to Table 7-23 (in Section 7.6) for details on general sensitivity of marine reptiles to oiling.		
Potential consequence from LOWC condensate release		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Some individual marine reptiles may come into contact with low, moderate and high hydrocarbon exposure on the sea surface during	Some individual marine reptiles may come into contact with low, moderate and high hydrocarbon exposure in-	There are no turtle nesting sites on the

transitory behaviours in the Bass Strait. Turtle interaction with floating oil is expected to include direct contact due to resting behaviours floating on the sea surface and through inhalation of volatile compounds in the vicinity of unweathered hydrocarbons. At moderate and high concentrations, toxicity impacts may occur including sub-lethal irritation of skin or cavities. However, due to the absence of turtle BIAs and nesting locations in Bass Strait and the Otway region and the low number of turtles foraging or migrating through Bass Strait in general, the consequence of a LOWC condensate release to threatened turtle individuals and populations is **Minor**.	water, while swimming or feeding. At the moderate and high concentrations, toxicity impacts may occur including sub- lethal irritation of skin or cavities. However, due to the absence of turtle BIAs and nesting locations in Bass Strait and the Otway region and the low number of turtles foraging or migrating through Bass Strait in general, the consequence of a LOWC condensate to threatened turtle individuals and populations is **Minor**.	southern Victorian coast, offshore islands or Tasmanian shorelines. Thus, the consequence of shoreline condensate to threatened turtle individuals and populations is **Minor**.

Summary of predicted impact level to marine reptiles	**Risk rating**
A LOWC condensate has the potential to result in: • Change in fauna behaviour • Injury/mortality to fauna The extent of the area of impact is predicted to be limited to moderate threshold of surface (floating) and in-water hydrocarbon exposure in the upper water column (0-10 m depth). The consequence of a LOWC condensate on injury/mortality or change in behaviour has been assessed as **Minor (2)**, based on: • Risk of direct contact, ingestion or inhalation amongst marine turtles is largely determined by behaviours and habitat preferences. With those at greatest risk displaying behaviours and characteristics causing greater opportunity for exposure including: ○ Proportion of the time spent at the sea surface, creating increased opportunity for direct exposure, inhalation or ingestion ○ Occurrence of biologically important behaviours, particularly where nesting location occur within the EMBA (i.e. breeding or feeding may override any tendency for to avoid hydrocarbons) • Marine reptiles are highly mobile and able to avoid noxious presence of hydrocarbons, as such generally it is very unlikely for marine turtles to be exposed to concentrations of hydrocarbons for durations that would lead to chronic toxicity effects. • There are no nesting or internesting areas identified as habitat critical to the survival of marine turtles in the waters of southern Australia, removing risk of impact to eggs and hatchlings which are most vulnerable to chronic toxicity effects in the event of a LOWC condensate. • The Recovery Plan for Marine Turtles in Australia identifies acute chemical discharge (including spills from vessels) as a threat to the long term survival of marine turtles. However, no marine turtle stock group is identified to overlap with the low threshold EMBA, suggesting turtle occurrence in the south-east is transitory. Action Area A4 identifies minimising chemical and terrestrial discharge, with relevant management actions including: ○ Ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to ‘slow to recover habitats’, e.g. nesting habitat, seagrass meadows or coral reefs. ○ Quantify the impacts of decreased water quality on stock viability.	**Marine Reptiles** **Low (RR I)**

○ Quantify the accumulation and effects of anthropogenic toxins in marine turtles, their foraging habitats and subsequent stock viability. • The presence of marine turtles identified via PMST overlapping the EMBA are expected to be largely transitory or short term in nature. No BIAs or habitat critical to the survival of the species were identified. • A LOWC condensate is considered to result in short-term and localised impacts at an individual level, with no population level impact expected. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. Impact is expected to be restricted to individual fauna and unlikely to impede the recovery of a protected species or any associated food chains within the South-East bioregion.	

Table 7-37: Potential risk of LOWC condensate release on other marine and coastal users

General sensitivity to oiling - other marine and coastal users		
Sensitivity rating for commercial fisheries (Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421)	**Medium**	
Sensitivity rating for energy exploration and production	**Medium**	
Sensitivity rating for other marine and coastal users	**Medium**	
A description of commercial fisheries / other marine and coastal users in the EMBA is provided in:	Section 4.7	
Refer to Table 7-24 (in Section 7.6) for details on general sensitivity of commercial fisheries / other marine and coastal users to oiling.		
Potential consequence from LOWC condensate release		
Sea Surface	**Dissolved and Entrained Hydrocarbon In-water**	**Shoreline**
Commercial Fisheries A short-term (days to weeks) fishing exclusion zone may be implemented by AFMA or the Victorian or Tasmanian fishing authorities in the event of a spill. Given the temporary nature of any surface slick and the low fishing intensity in the EMBA, there are unlikely to be any significant impact on fisheries in terms of lost catches (and associated income). However, additional expense to individual fishers where contamination of fishing gear has occurred can be expected, whereby oiled surfaces	**Commercial Fisheries** In-water exposure to in-water hydrocarbons may result in a reduction in commercially targeted marine species, resulting in impacts to commercial fishing and aquaculture. Actual or potential contamination of seafood can affect commercial and recreational fishing and can impact seafood markets long after any actual risk to seafood from a spill has subsided (NOAA 2002) which can have economic impacts to the industry. Several commercial fisheries operate in the EMBA and overlap the spatial extent of the water column hydrocarbon predictions (Section 4.7).	**Commercial Fisheries** Vessels use local ports, many of which are not included within the EMBA. Where the EMBA includes moored fishing vessels, some staining or coasting of vessel hulls may occur. The consequence to commercial fisheries overall function or

may themselves be a source of secondary contamination until they are cleaned. The consequence to commercial fisheries overall function or its target catch species in the long-term is **Minor**. **Other Marine and Coastal Users** Marine and coastal users most at risk of surface (floating) hydrocarbons are largely restricted to shallower coastal waters and shorelines. Exposure of coastal waters and shoreline to surface (floating) oil is only expected at low thresholds (Org ID: 593, Event ID: 3133, FB ID: 262). Commercial shipping vessels may be present in the area where sea surface oil is present. Shipping access restrictions may be enforced for up to 90 days until well kill. Visible surface hydrocarbons (i.e. a rainbow sheen) have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities until successful well kill is achieved. This is anticipated to be within 90 days. Remaining surface condensate after well kill is expected to evaporate and decay rapidly being a non-persistent oil. The consequence to other marine and coastal users is **Minor**. **Energy Exploration and Production** The Thylacine platform, operated by Beach Energy, is located 16 km from the closest point of the operational area and is in the area where sea surface oil is predicted to be present. Production and/or development restrictions may be enforced for up to 90 days until well kill. Other energy exploration and production occurring in the Bass Strait are not anticipated to be significantly impacted by surface (floating). The consequence to	A fishing exclusion zone may be implemented by AFMA or the Victorian or Tasmanian fishing authorities in the event of a spill. For most fisheries described in Section 4.7, precautionary exclusion from fishing grounds can be expected until water quality monitoring verifies the absence of residual hydrocarbons, as such providing confidence to consumers in fisheries tainting. Therefore, the consequence to commercial fisheries operating the offshore environment where there are no expected impacts to overall function or target catch species in the long-term is **Minor**. However, for fisheries operating inshore (<10 m depth) along coastal sections (depending on the actual spill trajectory) consequence is expected to be **Moderate**. Stochastic modelling indicates the maximum extent of low to high exposure of the benthic layer to entrained hydrocarbons (in 0-10 m water depths) occurs in the nearshore environment along the Colac, Otway and Corangamite nearshore coast waters as well as King Island coast. Impacts to this fishery may eventuate in the form of a temporary and precautionary exclusion from fishing grounds until water quality monitoring verifies the absence of residual hydrocarbons. Extended exclusions zones maybe persist due to slower rate of degradation of entrained hydrocarbon components. Such fisheries may include Rock Lobster fishery (Vic), Giant Crab (Tas), Southern Rock Lobster (Tas), depending on actual spill trajectory. Any acute impacts are expected to be limited to small numbers of juvenile fish, larvae, and planktonic organisms, which are not expected to affect population viability or recruitment. Impacts from entrained exposure are unlikely to manifest at a fish population viability level. Any exclusion zone established would be limited to the safety exclusion zone around the vicinity of the release point, and due to the rapid weathering of hydrocarbons would only be in place whilst well-kill activities are enacted, therefore physical displacement to vessels is unlikely to be a significant impact. **Other Marine and Coastal Users** Marine users most at risk of in-water hydrocarbons are largely restricted to shallower coastal waters and shorelines. Exposure of coastal waters and shoreline is expected at moderate thresholds, in nearshore environment along the Colac and Otway coast sections as well as King Island coast (Org ID: 593, Event ID: 3133, FB ID: 262). In the event of a spill, it is understood that most seawater intakes are positioned subsurface and can be isolated to minimise contamination and equipment/stock damage resulting in project or	its target catch species in the long-term is **Minor**. **Other Marine and Coastal Users** Marine and coastal users most affected by shoreline accumulation of weathered hydrocarbons are recreational and chartered fishers and those engaging in water sports (e.g. surfing, boating, diving) (Org ID: 593, Event ID: 3133, FB ID: 262). The Kelp industry, both nearshore operators and shoreline harvesters, could be affected by short-term closures but would be expected to recover relatively rapidly, with no long-term or irreversible damage. [Paragraph added in response to Matter: S13]. The consequence to other marine and coastal users is **Moderate,** given likelihood of shoreline contact. **Energy Exploration and Production** No impacts to energy exploration and production are expected as a result of shoreline exposure.

energy exploration and production is **Minor,** given offshore nature of the spill and high energy offshore environment.	production impacts; however, the duration of isolation may have indirect impacts on stock (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 286). Precautionary exclusion from these areas may be implemented by local governments until water quality monitoring verifies the absence of residual hydrocarbons. The consequence to other marine and coastal users is **Moderate**. **Energy Exploration and Production** Energy exploration and production occurring in the Bass Strait may be impacted by in-water hydrocarbons, given intakes are typically located below sea surface. Based on spill modelling, any closure of water intakes is anticipated to be short term (days to weeks). However, given day rates of these operations the consequence is **Moderate**.	

Summary of predicted impact level to other marine and coastal users	Risk rating
A LOWC condensate release has the potential to result in: • Changes to the functions, interests or activities of other users • Change in aesthetic value The extent of the area of impact is predicted to be limited to locations where there is potential for marine and coastal users' equipment to come into contact with moderate threshold exposure or where activities are excluded from areas traditionally accessed. These are anticipated to be largely areas interacting with the upper water column (30 m depth) or where hydrocarbons are visible. The consequence of a LOWC condensate release on impacting individual marine and coastal users has been assessed as **Moderate (3)**, based on: • Risk of marine and coastal users equipment being contaminated or traditional access to locations being excluded is largely determined by location and volume of hydrocarbon spill in relation to these activities and visual extent of the spill. • Exclusion zones from areas are expected to be short to medium term (days to months) based on hydrocarbon weathering characteristics. • Precautionary exclusion from fishing grounds is expected to be based on water quality monitoring which verifies the absence of residual hydrocarbons, providing consumer confidence. • Impact to fish is expected to be short-term, given their ability to metabolise petroleum hydrocarbons. As such limited ill effects are expected in a small number of individual fish only, with tainting expected to return to reference levels within two months of exposure. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. If an incident occurred, its impacts would largely be restricted to the upper water column in the immediate vicinity of the spill, coastal areas and shoreline experiencing low (visible) threshold hydrocarbons exposure (Org ID: 593, Event ID: 3133, FB ID: 262). Impact is expected to be restricted to individual marine and coastal users and unlikely to affect an entire fishery.	**Other marine and coastal users** **Medium (RR II)**

Table 7-38: Potential risk of LOWC condensate release on coastal habitats and communities

General sensitivity to oiling - coastal habitats and communities	
Sensitivity rating for rocky shores, sandy beaches	**Low**
Sensitivity rating for other coastal habitats and communities	**Medium**
Sensitivity rating First Nations Heritage	**Medium**
Sensitivity rating for State Marine Protected Areas	**High**
A description of coastal habitats and communities in the EMBA is provided in:	Section 4.6.2
Refer to Table 7-25 (in Section 7.6) for details on general sensitivity of coastal habitats and communities to oiling. **Coastal TECs** The following listed TECs may be exposed to the moderate thresholds of hydrocarbons: • Subtropical and Temperate Coastal Salt Marsh (EPBC Listed Vulnerable) • Giant Kelp Forrest of SE Australia (EPBC Listed Endangered) • Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community (EPBC Listed Endangered) • Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata / E. brookeriana*) (EPBC Listed Critically Endangered) • Grassy Eucalypt Woodland of the Victorian Volcanic Plain (EPBC Listed Critically Endangered) • Natural Damp Grassland of the Victorian Coastal Plains (EPBC Listed Critically Endangered) • Natural Temperate Grassland of the Victorian Volcanic Plain (EPBC Listed Critically Endangered) • Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion (EPBC Listed Endangered) • Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (EPBC Listed Critically Endangered) • Tasmanian white gum (*Eucalyptus viminalis*) wet forest (EPBC Listed Critically Endangered) **Other Important Coastal Habitats** The following Listed RAMSAR wetlands may be exposed to moderate and above threshold for in-water (dissolved and entrained) hydrocarbons: • Corner Inlet • Gippsland Lakes • Glenelg Estuary and Discovery Bay Wetlands • Lavinia • Port Phillip Bay (western shoreline) and Bellarine peninsula • Western Port • Piccaninnie Ponds Karst, Victoria Listed RAMSAR wetlands are further assessed within the bird assessment above (Table 7-21). **King Island IBA**	

The IBA includes the entire coastline of King Island, which supports significant numbers of hooded plovers; Lavinia State Reserve, which supports orange-bellied parrots and endemic subspecies of bush birds; and three inshore islands which support large numbers of nesting seabirds. These islands are Christmas Island (a 63 ha Nature Reserve), New Year Island (a 98 ha Game Reserve, on which harvesting of shearwaters is allowed) and Councillor Island (11 ha of Crown Land). The coastline is a mixture of rocky outcrops and long sandy beaches with beach-washed kelp. The IBA is defined as the coastal strip extending from the low water mark to 1 km inland of the high-water mark around the entire island; this is intended to capture most significant habitat for shorebirds and orange-bellied parrots.

The IBA is further assessed within the bird assessment above (Table 7-21).

Lawrence Rocks IBA

This IBA includes the entire terrestrial land area of Lawrence Rocks Wildlife Reserve (approximately 8.3 ha) which consists of two small islets that lie about 2 km offshore of Point Danger and 6 km south-east of Portland. Habitat on the islets consists of exposed rock and some patches of exotic grasses and native and exotic herbs. The IBA contains >10% of the global population of the Australasian gannet and is a likely breeding location for the little penguin, cape gannet, black-faced cormorant, crested tern and the silver gull (Birdlife International 2023).

The IBA is further assessed within the bird assessment above (Table 7-21).

Port Fairy to Warrnambool IBA

The IBA includes 17 km of beach and associated coastal dune scrub between Port Fairy and Warrnambool in western Victoria. Prominent vegetation within the area includes dense coastal dune scrub and a mosaic of aquatic herb lands, coastal saltmarsh and damp saline pasture. The IBA regularly supports a non-breeding population of the critically endangered orange-bellied parrot and a breeding population of the near threatened hooded plover (Birdlife International 2023).

The IBA is further assessed within the bird assessment above (Table 7-21).

Otway Range IBA

The IBA is consistent with Great Otway National Park which is approximately 150 km south-west of Melbourne. The coastline associated with this National Park runs between Torquay and Princetown with vegetation consisting of closed tussock grasslands and wind-pruned shrublands. Fifty-nine rare or threatened bird species have been recorded from Great Otway National Park, including five species listed at national level (shy albatross, wandering albatross, swift parrot, southern giant-petrel and fairy prion) and at least eighteen species listed under international treaties (Birdlife International 2023).

The IBA is further assessed within the bird assessment above (Table 7-21).

Hunter Island Group IBA

The Hunter Island IBA consists of numerous, varied islands off north-west Tasmania. Habitat of the islands ranges from exposed granite outcrops interspersed with sandy beaches and dunes, swamps, lagoons, thick vegetation, cliffs, grassy hills, heathland to woodland copses, with some of the larger islands, such as Hunter Island, also consisting of cattle-grazed paddocks, settlement and infrastructure. The IBA supports more than 1% of the world population of a number of species, including large resident population of Cape Barren Goose, and numerous breeding pairs of Short-tailed Shearwater, Black-faced Cormorant, Sooty Oystercatcher, Common Diving-Petrel, Little Penguin, White-faced Storm-Petrel, and Pacific Gull. It also supports the critically endangered Orange-bellied Parrot on migration between Tasmania and mainland south-eastern Australia. Most of Tasmania's endemic forest birds breed in the IBA (Birdlife International 2023).

North-west Tasmanian Coast

This IBA is the 10 km-wide coastal fringe which extends around the western coast of Tasmania from Low Rocky Point to Rocky Cape. The coast comprises rocky headlands, sandy beaches, well-developed sand dune systems, and a coastal plain which contains lagoons, swamps, heathland, buttongrass and eucalypt woodlands and forests. This IBA regularly supports the critically endangered Orange-bellied Parrot on migration. It also provides non-breeding habitat for the endangered Swift Parrot; supports significant numbers of the vulnerable Fairy Tern, the near threatened hooded plover and the congregatory Cape Barren Goose and Pied Oystercatcher; and supports populations of ten restricted-range (endemic) and two biome-restricted species (Birdlife International 2023).

Phillip Island IBA

The IBA is comprised of the Phillip Island Nature Park, along the south coast of the island in central Victoria. It includes a number of sandy beaches, patches of coastal vegetation (herblands, grasslands and scrub) and the offshore rock formations of The Nobbies and Seal Rocks. The IBA supports more than 1% of the global populations of the Little Penguin, Short-tailed Shearwater and Pacific Gull. The IBA has also infrequently supported small numbers of the Orange-bellied Parrot. The IBA supports one of the largest breeding colonies of Crested Terns in Victoria (Birdlife International 2023).

Wilsons Promontory Islands IBA

The IBA is comprised of 19 small granitic islands off the coast of Wilsons Promontory, Victoria. The habitat of the IBA mainly consists of shrubland, tussock grassland or a mixture of each, with extensive areas of exposed rock around the shorelines of some of the smaller islands. The IBA supports more than 1% of the global populations of Short-tailed Shearwater, Pacific Gull and Black-faced Cormorant (Birdlife International 2023).

World Heritage Areas

The Tasmanian Wilderness World Heritage Area (TWWHA) may be exposed to moderate and above threshold hydrocarbons along its coastal extent of 755 km in the south-south-west of Tasmania. As described in Section 4.4.2, the region is renowned for its diversity of flora with some of the longest-lived trees and tallest flowering plants in the world and provides a stronghold for several animals that are either extinct or threatened on mainland Australia. The area is also a precious cultural landscape for Tasmanian First Nations people who have lived there for at least 35,000 years (see First Nations Heritage below). The sensitivity of marine flora and fauna to oiling is discussed in detail in the tables above.

First Nations Heritage

As described in Section 4.8.2, First Nations people have an intimate and ongoing relationship with the coastal and marine environment, with strong links to both tangible and intangible elements of the oceans. Cultural heritage sites and places including rock art, middens and stone quarry's that are present along the coastline could also be impacted by hydrocarbons depending on location, spill trajectory and presence within area exposed to tidal inundation (Org ID: 92, Event ID: 3818, FB ID: 409). The sensitivity of marine flora and fauna to oiling is discussed in detail in the tables above.

State Marine Protected Areas

The following state marine protected areas may be exposed to moderate and above threshold hydrocarbons:

- Twelve Apostles
- Wilsons Promontory
- Bunurong
- Cape Howe
- Ninety Mile Beach
- Point Hicks
- Yaringa
- Churchill Island
- Corner Inlet
- Discovery Bay
- French Island
- Point Addis
- Port Phillip Heads
- Batemans

Potential consequence from LOWC condensate release	
Shoreline	
The shorelines predicted to be exposed to moderate hydrocarbon threshold loading are exposed, mostly rocky and are subject to strong wave action assisting in natural degradation of hydrocarbons. Areas of low exposure to shoreline loading are not expected to exhibit environmental harm. Due to the exposed nature of the shoreline, long-term toxicity or smothering effects in areas of moderate hydrocarbon exposure are not expected and natural weathering should result in rapid recovery of communities. High shoreline exposure thresholds are predicted at King Island, and to a lesser extent Moyne, Lady Julia Percy Island, Warrnambool, and Glenelg. Much of King Island coastline is comprised of rocky shores with cliff- dominated coastline present adjacent the operational area. Much of the coastline at Moyne and Warrnambool is comprised of rocky shores and cliffs which are interspersed with long sections of sandy beach. Glenelg coastline is rocky shores and cliffs, and estuary inlets interspersed with long sections of sandy beaches and dunes. Lady Julia Percy Island is an uninhabited island off the coast of Victoria, which a shoreline comprised of cliffs, rock platforms and reefs. Potential impacts on socio-economic receptors (tourism, cultural and/or other social values) are more likely to occur as a result of visual/ aesthetic impacts, rather than ecological impacts of hydrocarbon exposure at low threshold. The accumulation of oil along shorelines that are important to First Nations groups and individuals could also occur and, although likely to be weathered and degraded by the time they reach the coast with little toxicity, it may result in short-term restrictions to food collection (e.g., shellfish). First Nations heritage sites and places along the coast (such as dunes, quarries and shell middens) could be impacted by a spill where they are located below the high-water mark. Shorelines predicted to be exposed to moderate hydrocarbon threshold loading are exposed, mostly rocky and are subject to strong wave action assisting in natural degradation of hydrocarbons, with no long-term or permanent changes expected (Org ID: 92, Event ID: 3818, FB ID: 409). Ramsar sites potentially exposed to hydrocarbons include Corner Inlet, Gippsland Lakes, Glenelg Estuary and Discovery Bay Wetlands, Piccaninnie Ponds Karst, Lavinia, Port Phillip Bay and Bellarine Peninsula and Western Port. Ramsar wetlands have continuity with the sea, including saline marsh areas and estuarine environments that support large numbers of water birds. Wetlands are considered to have a high sensitivity to hydrocarbon exposure. Wetland vegetation (which can include saltmarsh and other estuarine plants) typically have a large surface area for oil absorption and their structure traps oil. The degree of impact of oil on wetland vegetation are variable and complex, and can be both acute and chronic, ranging from short-term disruption of plant functioning to mortality. Spills reaching wetlands during the growing season will have a more severe impact than if oil reaches wetlands during the times when many plant species are dormant. Wetland habitat can be of particular importance for some species of birds, fish and invertebrates. As such, in addition to direct impacts on plants, oil that reaches wetlands also affects these fauna utilising wetlands during their life cycle. Given the potential for sensitive wetland habitat including saltmarsh to be exposed to hydrocarbons above the actionable >100 g/m^2 shoreline exposure thresholds, the length of shoreline that has the potential to be exposed and the peak volume potentially accumulated ashore, the consequence has been ranked as **Moderate**.	
Summary of predicted impact level to coastal habitats and communities	**Risk rating**
A LOWC condensate release has the potential to result in: • Change in ecosystem dynamics • Change in fauna behaviour	**Coastal Habitats and Communities** **Medium (RR II)**

• Change in aesthetic value The extent of the area of ecological impact is predicted to be within the limits of the shoreline moderate exposure threshold, and expected to be short-term, and recoverable by natural degradation. While socio-economic impacts are predicted to extend to the low (visible) threshold, it is similarly expected to persist short-term as a result of natural degradation of hydrocarbon. The consequence of LOWC condensate release to coastal habitats and communities on ecological, cultural and socio-economic has been assessed as **Moderate (3)**, based on: • The action of reflected waves off rocky shores and exposed sandy beach, together with predicted weathering, means it is unlikely that toxicity or smothering effects to exposed biota will occur in coastal habitats (further from spill location). In exposed areas hydrocarbons is likely to be continually washed off the substrate and into the water, leading to further weathering. • Exposure pathways of species to weathered oil (i.e. smothering and potential ingestion for some species) are less likely to result in adverse effects. • Moderate threshold for shoreline accumulation does not overlap with any listed critical habitats but may overlap TECs. • Ramsar sites including Corner Inlet, Gippsland Lakes, Glenelg Estuary and Discovery Bay Wetlands, Lavinia, Port Phillip Bay and Bellarine Peninsula and Western Port are exposed to hydrocarbon which could result in ecological impacts to habitat function. • Visible EMBA overlaps with coastal areas utilised by tourism and recreation however predicted weathering means that visible thresholds will be present for a short time only. • World Heritage Areas, such as the Tasmanian Wilderness WHA, may be exposed to hydrocarbons which could result in adverse impacts to the coastal habitat value, however no long-term or permanent changes to the coastal environment are expected. • During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88). ConocoPhillips Australia understands that First Nations people are linked to the marine environment and may be affected by a change in the environment. Although no long-term or permanent changes to the marine environment or coastal sites and places are expected (Org ID: 92, Event ID: 3818, FB ID: 409), it is considered that the visual presence of floating oil or shoreline oil accumulations may impact Sea Country at a spiritual level (e.g., rituals, song lines, animal totems). These impacts could affect culturally important activities such as mutton-birding, or affect totem fauna. Controls are in place to reduce the likelihood of a LOWC event to **Remote (2)** and ensure an efficient response should an event occur, thus reducing the potential environmental impacts. These systems are well practiced and well understood. If an incident occurred, it would be restricted to localised coastal communities and unlikely to impede the recovery of coastal communities with Listed critical habitats. Further, the implementation of a Cultural Heritage Protection Program (CM05) will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area that may be affected by a LOWC event.	

7.7.6. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context B** has been applied:

- Impacts are relatively well understood, and uncertainty has been managed through site specific modelling
- Activities are common and well-practised
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Additional control measures have been considered to ensure impacts are managed to ALARP and acceptable levels.

Table 7-39 documents the assessment of control measures and ALARP demonstration for LOWC.

Table 7-39: LOWC condensate release control measures and ALARP demonstration

Adopted Control Measures	
Control	**Source of good practice control measure**
Preventative	
CM01: Marine Assurance Process	AMSA MO 21: Safety and emergency arrangements gives effect to SOLAS regulations dealing with life-saving appliances and arrangements, safety of navigation and special measures to enhance maritime safety. AMSA MO 30: Prevention of collisions requires that onboard navigation, radar equipment, and lighting meets the International Rules for Preventing Collisions at Sea (COLREGs) and industry standards. All vessels contracted to ConocoPhillips Australia will have in date certification in accordance with AMSA MO 31: SOLAS and non-SOLAS certification AMSA MO 27: Safety of navigation and radio equipment gives effect to SOLAS regulations regarding radiocommunication and safety of navigation, and provides for navigation safety measures and equipment and radio equipment requirements.
CM02: Vessel and MODU Operating Procedures	A 500 m petroleum safety zone will be established around the MODU during the drilling activity. Documented maintenance program is in place for equipment on vessels and MODU that provides a status on the maintenance of equipment. Engines, machinery and equipment are maintained in accordance with MODU PMS. MODU and support vessel have and implement a SOPEP, or SMPEP, pursuant to MARPOL Annex I. SOPEP or SMPEP spill response exercises conducted at frequency specified in plans to ensure personnel are prepared. Prior to the drilling each well covered under this EP, there will be a well-specific source control plan in place.
CM03: Marine and Coastal Users Consultation and Communication Plan	Specific notifications will be provided as follows, prior to arrival in the operational areas and on departure, so the maritime industry is aware of petroleum activities: • AMSA's Rescue Centre (ARC) (minimum two days prior) (Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 8, 9) • Australian Hydrographic Office (AHO) (minimum four weeks prior) (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 159; Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 10) • Marine and Safety Tasmania (minimum 4 weeks prior and general updates) (Org ID: 10, Maritime and Safety Tasmania, Event ID: 509, FB ID: 6, 63) • Other relevant Authorities (minimum one week prior) • Ocean Racing Club Victoria (Org ID: 510, Ocean Racing Club of Victoria (ORCV), Event ID: 2617, FB ID: 62)

	• 48-hour look-ahead provided every 24-hours prior to and during key periods of activity (i.e. transit of rig) (Org ID: 6, Tuna Australia, Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 473) A Safe Operations Guide will be developed and implemented that details pre-activity and on-water communication processes, including SMS messages and radio communication on Channel 16. The guide will be developed based on feedback from consultation with other marine and coastal users during the preparation of the EP and adjustment protocol (Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 474; Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 427-429; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 345; Org ID: 462, Mahina Bay Fishing Co Pty Ltd, Event ID: 3432, FB ID: 344; Org ID: 607, Event ID 2527: FB ID: 102; Org ID: 593, Event ID: 2512, FB ID: 168; Org ID: 50, Tasmanian Seafood Industry Council (TSIC), Event ID: 1821, FB ID: 152; Org ID: 433, Event ID: 2663, FB ID: 135; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 14; Org ID: 471, Richey Fishing Co Pty Ltd, Event ID: 536, FB ID: 12; Org ID: 490, Event ID: 507, FB ID: 3; Document ID: 3923).
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).
CM09: Drilling Program	The BOP shall be routinely function and pressure tested in accordance with industry standards and preventative maintenance will be in accordance with manufacturer's specifications and in alignment with Drilling Contractors preventative maintenance system. Pre-operational function and pressure test to be conducted and may be witnessed by additional third-party prior to campaign. Prior to campaign commencement, an assurance check will be undertaken in accordance with the Management of Change Procedure. Prior to campaign commencement a register of suitable relief well MODU's will be compiled and updated monthly during the campaign, or more frequently should any change in status of available MODU's occur.
CM15: Well Design and Delivery Process (WDDP)	ConocoPhillips-specific well design/well operation standards and manuals are in place manage operational risks associated with drilling to ALARP, including, but not limited to: • Well Construction and Intervention Standard • Well Management Standard • Well Control Manual • Casing and Tubing Design Manual • Well Design and Delivery Process Manual • Well Integrity Manual • Wells Competency Management Manual
CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan	The SCERP will be consistent with the International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019).
CM17: NOPSEMA Accepted Well Operations Management Plan	NOPSEMA accepted WOMP (Well Operations Management Plan) includes relief well locations, design, dynamic kill well plan, and control measures for well integrity and measures for suspension in heavy weather events.
CM18: Financial assurance for offshore activity (Org ID: 593, Event ID: 3133, FB ID: 262; Org ID: 593, Event ID: 2512, FB ID: 175, 176, 178)	Titleholders are required to hold financial assurance for offshore activities. NOPSEMA's Guideline 'Financial assurance for petroleum titles' states 'It is generally sufficient for the titleholder to hold financial assurance for the greatest reasonably credible costs, expenses and estimable third-party liabilities that may arise from a petroleum incident relating to their activities, and as defined by termination or control of the incident; operational response measures required for containment, clean up and remediation of the environment; and carrying out environmental monitoring of the impact of the petroleum incident. The scope for oil spill compensation would be in accordance with international compensation protocols such as the International Oil Pollution Compensation Funds. All claims would be assessed, reasonable evidence-based claims would be paid, and claims can be for both short-term cash flow issues and long-term losses. Suitable calculation methods would be negotiated by an independent arbiter, in the highly unlikely event or an incident.

Response	
CM13: NOPSEMA Accepted Oil Pollution Emergency Plan (OPEP)	In the event of a hydrocarbon spill to sea, the OPEP requirements are implemented to mitigate environmental impacts (Org ID: 111, Australian Marine Conservation Society, Event ID: 4153, FB ID: 455).
CM14: Operational and Scientific Monitoring Program	Operational and scientific monitoring capability shall be maintained in accordance with the OSMP: • A month prior to the commencement of drilling a review of the contracted OSMP provider/s capability will be undertaken by ConocoPhillips Australia to ensure that the OSMP requirements can be met by the contracted OSMP provider/s. • During drilling the contracted OSMP provider/s will provide a monthly report to show that capability as detailed in the OSMP is maintained. • The contracted OSMP provider/s capability to meet the requirements detailed in the OSMP will be tested prior to commencing drilling.
CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan	Emergency response capability to implement an effective well kill operation shall be maintained in accordance with well specific SCERP. The SCERP shall be consistent with the International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019), specifically detailing: • The structure and function of the wells Emergency Team (WET) • A timeline for the effective implementation of source control key events / actions • A well-specific worst-case discharge (WCD) analysis • Gas plume study • Relief well plan including dynamic kill analysis • APPEA MoU to be in place for mutual assistance i.e. relief well planning.

Additional Controls Assessed			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Elimination			
Do not undertake the Otway Exploration Drilling Program	Elimination of potential for LOWC event.	The Otway Exploration Drilling Program is required to meet the petroleum title commitments, and to secure gas for domestic supply.	Reject
Reduction			
Assurance ConocoPhillips Drilling and Completions Source Control Team can be activated and mobilised within 24 hours	Controlling flow of hydrocarbons as quickly as possible will reduce environmental impacts. Limit / prevent hydrocarbon contacting sensitive receptors.	Cost of contracts/ MOUs considered appropriate.	Adopt CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Contract/ MOUs for source control personnel. Well Control Specialists mobilised within 72 hours.	Controlling flow of hydrocarbons as quickly as possible will reduce environmental impacts. Limit / prevent hydrocarbon contacting sensitive receptors.	Cost of contracts/ MOUs considered appropriate.	Adopt CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Contract source control personnel through an alternative provider in addition to existing arrangements.	No environmental benefit if additional services are surplus to requirements.	Significant additional cost in maintaining two contracts for the same service with no defined benefit.	Reject
Contract/ MOUs for source control personnel to be located within a response-ready location (e.g. Geelong,	No environmental benefit as existing contracted personnel are available to provide support within 72 hours which will coincide with starting to	Significant cost and effort to have source control personnel	Reject

Australia) to respond immediately to a LOWC during the campaign.	commence sourcing source control strategies.	located in Geelong for standby purposes with limited benefit.	
Campaign assurance check to ensure that the available relief well rigs are able to meet the 90-day timeframe defined within the OPEP.	Ensures consideration of worst-case hydrocarbon spill scenario for the proposed activity based on actual vessel, MODU and activity details. Ensures relief well MODU availability is confirmed to be able to meet the timeframes defined in the OPEP prior to spud.	Administrative costs to undertake assurance check and risk assessments for each campaign considered appropriate.	Adopt CM09: Drilling Program
Monitor MODU Register i.e. monthly or more frequently as determined by the assurance process and safety case status – whilst drilling activities are occurring	Maintaining an understanding of which MODU(s) may be rapidly available for relief well operations, reducing mobilisation times for MODU and reducing volume of hydrocarbon released to the environment.	Effort spent monitoring considered appropriate.	Adopt CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Contracts/ MOUs for Subsea First Response Toolkit - AMOSC (SFRT) (provides for subsea dispersant application and light debris clearance) including trained responders	Supports decision making for source control strategy, and potentially allows for debris clearance to support a faster response, reducing volume of hydrocarbon released to the environment.	Available via AMOSC contract. Additional time and effort to mobilise and implement use of SFRT considered appropriate.	Adopt CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Relief Well Design Assessment (pre-drilling)	Assessment to identify and screen relief well spud locations prior to drill campaign to reduce time taken to plan and execute relief well and reduce environmental impacts.	Effort required to conduct relief well assessment considered appropriate.	Adopt CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Pre-purchase or access agreement for relief drilling supplies, including long-lead items e.g. casing, casing shoes and wellhead equipment	Relief well drilling supplies such as casings and well head equipment could potentially reduce relief well drilling times.	Additional cost, effort and time for maintenance and storage considered appropriate.	Adopt CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Direct Intervention via ROV contractor (ROV available on rig - use if available / additional ROV to be supplied to site) using supplied source control equipment ("hot stab") obtained via contracted company	Reduces time taken to control source and reduces environmental impacts.	Ability to implement and effectiveness of this control can only be determined at the time of an incident.	Adopt CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Capping Stack System (CSS)	Well CSS is designed to stem the hydrocarbon flow prior to permanent plugging of the well.	Due to the technical complexity of deploying a capping stack in shallow waters with a gas plume environment and harsh metocean conditions, a relief well has been determined to be the primary means source control. The significant HSE risk associated with deploying a capping stack, the very low probability of effective deployment and trade-offs are considered grossly disproportionate to the benefit	Reject

		gained. [Updated in response to Matter S30].	
Implementation of a Mudline Closure Device (MCD) – Independent Well Control Device	Independently controlled and activated BOP below the rig BOP or within the rigs BOP Ram cavities that can be activated in the event of a loss of well control to seal the well if the rig BOP system fails or is inoperable. Remote activation from a vessel or ROV allows the system to be activated if the rig is evacuated or damaged. Due to the additional height of the MCD - BOP tethering will likely be required - meaning 4 gravity-based structures will be required. Depending on the type of MCD system, an additional two subsea hydraulic units may also be on the seabed.	Engineering / modelling of the conductor fatigue will support decision-making around the suitability and costs associated with the MCD unit. Additional Cost. The time to install and rig down would be estimated to be 4 days of critical path time.	Adopt (Pending feasibility assessment) CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
MCD function and pressure testing	Depending on the type of MCD selected, the MCD would be function tested and pressure tested per manufacturers recommendations. The KBOS system is pressure tested only and not function tested. Constant measurement of the circuit connectivity is performed allowing operators to know when there is a problem so it can be addressed.	Engineering / modelling of the conductor fatigue will support decision-making around the suitability and costs associated with the MCD unit. Time and effort to conduct BOP pressure test during deployment.	Adopt (Pending feasibility assessment) CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
MCD Plan and Procedures	To ensure the independent well control device is activated and deployed as per manufacturers guidelines to limit risks associated with the strategy and ensure successful implementation.	Time and effort to include within existing source control plans. As per standard.	Adopt (Pending feasibility assessment) CM16: Source Control Emergency Response Plan (SCERP), inclusive of Relief Well Plan
Dispersant application	Dispersants may be effective to reduce VOCs at surface to below lower explosive limits.	Chemical dispersants are considered ineffective for gas-condensate hydrocarbon releases. Given the installation of a capping stack is not a feasible response option, and a relief well would be offset to the release location, there is no potential benefit with applying subsea dispersants.	Reject
Dedicated MODU on standby	Provides for rapid mobilisation of relief well rig to location, reducing duration of spill by approximately 20-30 days. The key benefit would be a reduction in shoreline loading from weathered, residual fractions of the condensate. Could halve the time to implement source control, therefore, the overall potential reduction in exposure to shorelines may halve. Halving the potential loading at a moderate threshold would produce a marginal	Any MODU on standby would require an in-force Safety Case to operate in Australian Commonwealth waters. Evaluation of trade-offs indicates significant increases in operational discharges, emissions and underwater sound and associated impacts, regardless of if a LOWC were to occur. Having a MODU on standby would require significant	Reject

	overall environment benefit given the nature of weathered condensate.	commercial effort and cost (approx. $800k / day) that that are considered grossly disproportionate to the level of benefit gained given the relatively small level of potential shoreline oiling at moderate levels.	
Use of two drilling rigs during campaign that drill simultaneously so that one rig could act as a relief well drilling rig for the other.	Could reduce the length of time taken to drill a relief well and may reduce the timeframe for stopping a release by 20-30 days. Reduction in spill duration results in less hydrocarbon exposure and reduced shoreline loading of weathered condensate.	Additional costs associated with second MODU mobilisation and demobilisation of approximately $5MMUSD plus a premium of $50K/day to align the contract windows. Additional trade-offs as detailed above for dedicated MODU on standby, regardless of if a LOWC were to occur. Effort and cost are considered grossly disproportionate to the level of benefit gained and trade-off impacts.	Reject
Mitigation			
Pre-drill riser less intervals for a potential relief well before drilling the main well.	Reduces the relief well drill duration, therefore, reducing the volume released.	Additional effort and time for pre-drilling activity at each well, with significant cost. Trade-off evaluation identifies additional drill cuttings and discharges, and noise emissions regardless of if a LOWC were to occur. Costs and trade-offs considered grossly disproportionate to the reduction in consequence.	Reject

Receptor	Sensitivity	Consequence	Likelihood	Risk Rating
Benthic Assemblages	Low	Moderate (3)	Remote	Medium (RR II)
Plankton	Low	Minor (2)	Remote	Low (RR I)
Marine Invertebrates	Low	Minor (2)	Remote	Low (RR I)
Fish	Low	Minor (2)	Remote	Low (RR I)
Seabirds	Medium	Major (4)	Remote	Medium (RR II)
Shorebirds	High	Major (4)	Remote	Medium (RR II)
Aquatic birds	High	Moderate (3)	Remote	Medium (RR II)
Cetaceans	Medium	Major (4)	Remote	Medium (RR II)
Pinnipeds	High	Moderate (3)	Remote	Medium (RR II)
Marine Reptiles	Medium	Minor (2)	Remote	Low (RR I)
Other Marine and Coastal Users	Medium	Moderate (3)	Remote	Medium (RR II)
Rocky shores, sandy beaches	Low	Moderate (3)	Remote	Medium (RR II)
Other coastal habitats and communities	Medium	Moderate (3)	Remote	Medium (RR II)
First Nations Heritage	Medium	Moderate (3)	Remote	Medium (RR II)

ALARP Statement	The decision context has been assessed as Type B, with predictive uncertainty managed through oil spill trajectory modelling. The residual consequence ratings are lower order – Low (RR I) to higher order – Medium (RR II). The adopted control measures minimise the likelihood of a LOWC event and reduce the consequence of a release through effective response preparedness, and are considered effective and appropriate to the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were practicable to implement. Therefore, the predicted risks to the environment from a LOWC event associated with the Otway Exploration Drilling Program are reduced to ALARP.

7.7.7. Acceptability Assessment

Table 7-40 compares the predicted risk levels for an unplanned loss of well control against the acceptable levels.

Table 7-40: Comparison of defined acceptable levels with risk levels for loss of well control (LOWC)

Defined Acceptable Levels			
Source	**Level**	**Predicted Risk Level**	**Is predicted risk below defined acceptable level?**
Principles of ESD	Activities that result in temporary / reversible, small scale, and/or low intensity environmental damage. Environmental risks have a worst-case ranking of less than Significant (RR III).	Planned activities not expected to result in a LOWC event leading to unplanned release of condensate. The highest residual risk ranking is **Medium (RR II)**.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious / irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction. Oil Spill Trajectory Modelling has been undertaken to reduce uncertainty in the spatial and temporal extent of potential impacts.	Yes
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	The following Conservation Advice / Recovery Plans identify pollution as a key threat: • Conservation Advice *Balaenoptera borealis* (sei whale) (TSSC 2015g) • Conservation Advice *Balaenoptera physalus* (fin whale) (TSSC 2015f) • Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017b), identified as acute chemical discharge (oil pollution) • Conservation Advice *Calidris ferruginea* (curlew sandpiper) (DCCEEW 2023b) identified as Habitat degradation/ modification (oil pollution) • National Recovery Plan for albatrosses and petrels (2022) (DCCEEW 2022e) • Conservation Advice for *Sterna nereis nereis* (fairy tern) (DSEWPaC 2011c) The following Conservation Advice / Recovery Plans identify habitats degradation/modification or deterioration of water quality as threat, which may be consequence of accidental release of hydrocarbon:	Yes

		• Conservation Advice *Calidris canutus* (red knot) (DCCEEW 2024c) • Conservation Advice for *Limosa lapponica baueri* (Alaskan bar-tailed godwit) (DCCEEW 2024a) • Conservation Advice for *Numenius madagascariensis* (eastern curlew) (DCCEEW 2023a) • Draft National Recovery Plan for the Australian Painted Snipe (Commonwealth of Australia 2019e) These Conservation Advice / Recovery Plans identify the following conservation actions: • Minimise chemical and terrestrial discharge. Controls have been identified and will be implemented to minimise the risk of minimise chemical discharges. • Ensure spill risk strategies and response programs include management for turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g. nesting habitat, seagrass meadows or coral reefs. No habitats for turtles are identified within the LOC spill EMBA. OPEP and OSMP cover management of response to oiled turtles. • Ensure appropriate oil-spill contingency plans are in place for the subspecies' breeding sites which are vulnerable to oil spills. OPEP and OSMP cover response strategies for management breeding sites vulnerable to oil spills. • Implement measures to reduce adverse impacts of habitat degradation and/or modification. Controls have been identified and will be implemented to reduce adverse impacts of habitat degradation and/or modification. The activity will be managed in a way that is not inconsistent with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) (DNP 2013).	
Biological Ecological Economic Cultural	No unplanned objects, emissions or discharges to sea or air. No death or injury to listed threatened or migratory species from the activity. No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health. Undertake the activity in a manner that will not interfere with other marine and coastal users to a greater extent than is necessary for the exercise of right conferred by the titles granted.	No releases of gas condensate are planned.	Yes

<table>
<tr><td>ConocoPhillips Australia Policies</td><td>All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.</td><td colspan="2">Adopted controls measures as listed above have been assessed to ensure that environmental risks will be of an acceptable level throughout the Otway Exploration Drilling Program.</td><td>Yes</td></tr>
<tr><td rowspan="3">ConocoPhillips Australia Policies</td><td rowspan="3">Environmental impacts and risks are consistent with environmental policies and processes such that residual environmental risks will be below Significant (RR III).</td><td>Likelihood</td><td>Remote (2) (1.6×10^{-4} for exploration gas wells operated to North Sea Standard with BOP installed including shear ram and two barrier principle followed) (IOGP 2019).</td><td rowspan="3">Yes</td></tr>
<tr><td>Consequence</td><td>Major (4) based on highest consequence ranking in Table 7-39.</td></tr>
<tr><td>Risk</td><td>Medium (RR II)</td></tr>
</table>

Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to IMS have been considered (with more detail provided in Section 3). These include: • Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 370 – Modelling locations • Org ID: 20, Department of Climate Change Energy the Environment and Water (DCCEEW), Event ID: 4184, FB ID: 467 – Southern right whale BIAs • Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 285 – identification of aquaculture facilities • Org ID: 593, Event ID: 3133, FB ID: 262; Org ID: 593, Event ID: 2512, FB ID: 175, 176, 178– Impacts to coastal communities and financial assurance • Org ID: 137, Org ID: 138, Event ID: 3948, FB ID: 421 – impacts of spills to giant crab fisheries • Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 386 – impacts of spills to Zeehan MP • Org ID: 111, Australian Marine Conservation Society, Event ID: 4153, FB ID: 455 – Spill response plan • Org ID: 92, Event ID: 3818, FB ID: 409 – Impacts to cultural heritage along the coastline • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • (Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 8, 9) – AMSA notifications • (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 159; Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 10) – AHO notifications • (Org ID: 10, Maritime and Safety Tasmania, Event ID: 509, FB ID: 6, 63) – MAST notifications • (Org ID: 510, Ocean Racing Club of Victoria (ORCV), Event ID: 2617, FB ID: 62) – Ocean Racing Club Victoria notifications • (Org ID: 6, Tuna Australia, Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 473) – 48-hour look ahead	Yes
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type B risks are considered acceptable if the requirements in Table 7-28 can be demonstrated and if the level of residual risk has a rating less than Significant (RR III)).		

	Following completion of the risk assessment process, the environmental risks arising from an unplanned release of condensate during a loss of well control event are acceptable because: • The impacts associated with gas condensate exposure are well known and engineering risk-based tools have been used to assess the results of oil spill trajectory modelling. • Good practice controls are well defined and well implemented. • In the unlikely event of a LOWC, ConocoPhillips Australia has an OPEP in place to facilitate a rapid and effective response, and an OSMP to support the response and monitor impact and recovery over time. • The risk of a LOWC event associated with the Otway Exploration Drilling Program is considered to be of an acceptable level given the remote likelihood and significant control measures in place. The control measures that will be implemented throughout the Otway Exploration Drilling Program are considered effective and appropriate to manage the risks of a LOWC event. Based on the above evaluation, the risks associated with a LOWC event meet the defined acceptable levels.

7.7.8. Environmental Performance

Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance ConocoPhillips Australia is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with loss of well control event from the Otway Exploration Drilling Program are:

- EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO7: No unplanned objects, emissions or discharges to sea or air.
- EPO10: No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.

Section 9 – Table 9-1 sets out the Environmental Performance Standards (EPS) for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.

7.8. Spill Response Activities

This section of the EP documents ConocoPhillips Australia's risk assessment for impacts that may arise during an oil spill response as required by the Environment Regulations, namely section 21(5)(a) & (b) which states that the EP must include details of the environmental impacts and risks for the activity; and an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk, and section 21(6)(b) states that to avoid doubt the evaluation mentioned in 21(5)(b) must evaluate all the environmental impacts and risks arising directly or indirectly from potential emergency conditions, whether resulting from accident or any other reason.

ConocoPhillips Australia has developed an Oil Pollution Emergency Plan (OPEP) (Appendix I) as required by section 22(8).The OPEP is the primary reference document and key control measure to be implemented in the highly unlikely event of a hydrocarbon release whilst undertaking the activities covered in this EP.

7.8.1. Response Option Selection

Spill response strategies are triggered in the event of a hydrocarbon spill. However, not all response strategies and tactics are appropriate for every spill – options for a response vary based on factors such as hydrocarbon type, volume, location, sea state and spill trajectory. A combination of response strategies and tactics is required to form an effective response strategy.

ConocoPhillips Australia have conducted a preliminary Net Environmental Benefit Analysis (NEBA) to identify response strategies that will result in the lowest overall impact and maximum protection, or recovery of environmental, socio-economic and cultural receptors identified at risk within the spill

EMBAs (see Chapter 4). This process acknowledges that some response and clean-up activities may result in a negative impact, compared to natural weathering or other strategies.

The NEBA process is undertaken at a strategic level (pre-spill) to identify pre-determined recommended response strategies, while an Operational NEBA is undertaken routinely throughout an emergency response, as per the process described in the OPEP (Appendix I). Only the response strategies that are determined to be feasible and effective at producing a net benefit are risk assessed in this section.

Table 7-41 summarises the possible response strategies to the two credible scenarios considered for this EP, an unplanned loss of well control (LOWC) of gas condensate and an unplanned vessel spill of Marine Diesel Oil (MDO) and provides outcomes of the NEBA assessment as to the suitability of the response strategies. See Section 7.7 for further details of a LOWC and Section 7.6 for details of a MDO spill.

The response strategies considered potentially viable, based on the outcomes from the strategic NEBA, and assessed in this section include:

- Source Control
- Surveillance, Modelling and Visualisation (SMV)
- Natural Dispersion
- Shoreline Protection and Deflection (P&D)
- Shoreline Clean-up
- Oiled Wildlife Response (OWR)
- Waste Management
- Operational and Scientific Monitoring (OSM)

In the event of a spill, implementation of specific response strategies would be subject to the completion of the Operational NEBA. Natural recovery is not discussed further in this section, as specific tasks are not required. Continual SMV and NEBA will be undertaken as per the overarching response implementation process.

7.8.2. Strategic Net Environmental Benefit Analysis (NEBA)

The preliminary strategic NEBA, expanded to cover all potential response strategies for the two credible worst-case hydrocarbon release scenarios identified for the activity is outlined in Table 7-41.

Table 7-41: Strategic NEBA summary – feasibility, effectiveness (net environmental benefit (NEB)) and ALARP analysis

Response Strategy	Description	Tactics	Strategic NEBA Decision			
			LOWC		MDO	
			Feasibility and ALARP Analysis	NEB	Feasibility and ALARP Analysis	NEB
Source Control	Limit flow of hydrocarbons to the environment.	ROV Emergency BOP Intervention	**Feasible**. Response strategy that can be rapidly implemented to reduce the release of hydrocarbons into the marine environment whilst undergoing plans for the primary response strategy of a relief well.	✓	-	-
		Independent Well Control Device	**Feasible**. Would provide a rapid response time, substantially reducing the amount of hydrocarbon released into the marine environment.	✓	-	-
		Relief Well	**Feasible**. Primary response strategy. The operational area within the Otway Basin is considered remote locations and therefore an impact is likely to occur in the time taken to mobilise a relief well to location. This timeframe has been incorporated into the oil spill modelling for this activity. Due to the remote location, available rigs will be monitored on a monthly basis, ensuring that mobilisation of alternate rigs remains feasible within the assumed timeframes. Once a suitable MODU is identified interface shall be managed via the APPEA ‘memorandum of Understanding: Mutual assistance’ (to which Conoco Phillips Australia is a signatory) between Conoco Phillips Australia, the oil operator, the rig contractor, and the Australian Regulator. Source control planning has identified all reasonable controls to implement relief well response strategy in a timely manner. Conoco Phillips considers the potential	✓	-	-

Response Strategy	Description	Tactics	Strategic NEBA Decision			
			LOWC		MDO	
			Feasibility and ALARP Analysis	NEB	Feasibility and ALARP Analysis	NEB
			environmental benefit gained by having a pre-positioned alternate MODU on location to be grossly disproportionate given the high financial and logistical support cost associated with having a MODU on standby. All reasonable pre-planning has been undertaken to facilitate the timely initiation of a relief well if required.			
		Capping Stack System	**Not feasible**. Not feasible or safe to deploy within the current operational environment (water depth and metocean conditions). Rough sea states can negatively impact the ability to safely deploy a capping stack. Furthermore, if the deployment vessel undergoes too much movement from wave action during deployment, the equipment can come into contact with the subsea wellhead, damaging both the equipment and wellhead. For successful deployment adequate water depth is required. ConocoPhillips Australia has conducted a feasibility analysis which confirms that due to technical complexity of deploying a CSS in shallow waters with a gas plume environment and harsh metocean conditions the use of a capping stack is not operationally suitable for wells within the Otway Basin. Further to this, whilst on average there is 15% of the year below an Hs of 2m (54 days per year) in the Otway region, evidence from over 20 years of recorded sea states in the region demonstrates that the seas are not in this state for a period long enough to perform subsea operations. Once the subsea capping stack is connected to the winches, the vessel is effectively connected to the seafloor and a rapid escape is not possible without risk to equipment and personnel.	X	-	-
		Subsea First Response Toolkit (SFRT)	**Potentially feasible**. May support decision making for source control strategy, and potentially allow for debris clearance. Given that the use of a CSS is not operationally feasible, as described above, the use of the SFRT may not be required.	✓	-	-

Response Strategy	Description	Tactics	Strategic NEBA Decision			
			LOWC		MDO	
			Feasibility and ALARP Analysis	NEB	Feasibility and ALARP Analysis	NEB
		Subsea Dispersant Application	**Not feasible.** Subsea dispersant injection (SSDI) may reduce volatile organic compounds (VOCs) at sea surface within the response area, therefore creating a safer work environment for responders. Given the use of a capping stack is not operationally feasible, the application of subsea dispersant to reduce surface VOCs is not required. Therefore, not considered a viable or effective strategy.	X	-	-
		Vessel Source Control (SOPEP)	-	-	**Feasible**. Primary response strategy for all spills in accordance with vessel SMPEP/SOPEP. AMSA is the Control Agency in the event of a stricken vessel in Commonwealth waters, therefore no further controls are considered given their access to NatPlan resources.	✓
Surveillance, Modelling & Visualisation (SMV)	To maintain situational awareness, and ongoing monitoring and evaluation of the response.	Initial Hydrogen Characterisation Fate and weathering modelling Vessel Surveillance Aerial Surveillance Oil Spill Trajectory Modelling (OSTM) Satellite Tracking Buoys Satellite Imagery	**Feasible**. Primary response strategy. Strategy is critical for gaining and maintaining situational awareness to inform the response and remediation operations. Hydrocarbons likely visible on sea surface for duration of LOWC. Monitoring used to inform both response planning and monitoring requirements. All feasible monitoring techniques have been applied and monitoring personnel and equipment are readily available for deployment. Vessel and aerial monitoring capability in place. Tracking buoy will be maintained aboard MODU / support vessel whilst undertaking activity ready for deployment. No benefit gained by having additional monitoring capability.	✓	**Feasible**. Primary response strategy. Strategy is critical for gaining and maintaining situational awareness to inform the response and remediation operations. Hydrocarbons likely visible on sea surface for duration of MDO response. Monitoring used to inform both response planning and monitoring requirements. All feasible monitoring techniques have been applied and monitoring personnel and equipment are readily available for deployment. Vessel and aerial monitoring capability in place. Tracking buoy will be maintained aboard MODU / support vessel whilst undertaking activity ready for deployment. No benefit gained by having additional monitoring capability.	✓
Natural Dispersion	Allowing natural processes to break down the hydrocarbons present	Natural Dispersion	**Feasible**. Strategy is effective due to the characteristics of the condensate gas, and the metocean characteristics of the activity location.	✓	**Feasible**. Strategy is effective due to the characteristics of MDO and the metocean characteristics of the activity location.	✓

Response Strategy	Description	Tactics	Strategic NEBA Decision			
			LOWC		MDO	
			Feasibility and ALARP Analysis	NEB	Feasibility and ALARP Analysis	NEB
	within the marine environment.					
Surface Dispersant	Breakdown surface spills into small droplets within the water column. Allows for increased biodegradation, reducing the potential threat to marine fauna.	Vessel & Aerial Application	**Feasible, Not Recommended**. Not recommended for Group I oils such as condensate gas due to the very low viscosity and high volatility – generally no environmental benefit gained by the application on Group I oils. The ITOPF Technical Information Paper 4 – Dispersant Application1 states that light products (including gas condensate) generally do not form emulsions but rather a thin layer or sheen that evaporate and dissipate quickly. It is considered good practice that dispersants are not applied, rather other response options are used to recover the minimal remaining product in the environment. For vessel application - having vessels travel through gas condensate is not advisable and poses a hazard to responders due to the volatility of the gas condensate when released.	X	**Feasible, Not Recommended**. Although “conditional” for Group II oil, the size of the potential spill volume and the natural tendency of spreading into very thin films is evidence that dispersant will be an ineffective response. The dispersant droplets will penetrate through the thin oil layer and cause ‘herding’ of the oil. The ITOPF Technical Information Paper 4 – Dispersant Application1 states that light products (including marine diesel) generally do not form emulsions but rather a thin layer or sheen that evaporate and dissipate quickly. It is considered good practice that dispersants are not applied, rather other response options are used to recover the minimal remaining product in the environment.	X
Containment & Recovery (at sea)	Use of booms and skimmers to prevent the spread of surface hydrocarbon and reduce the potential threat to the marine environment.	Offshore booming	**Not feasible**. Condensate gas spreads rapidly to less than 10 g/m^2 and suitable thickness for recovery are only present for the first 48 hours within the vicinity of the release location, in the event of a LOWC scenario. Due to the hydrocarbon characteristics a large portion of this will be lost to evaporation. Not feasible due to the fate and behaviour (high volatility and spreading) of gas condensate.	X	**Not feasible**. MDO spreads rapidly to less than 10 g/m^2 and suitable thickness for recovery are only present for the first 48 hours, therefore, there is insufficient time to mobilise equipment. Not feasible due to the fate and behaviour (high volatility and spreading) of MDO.	X
In-Situ Burning	Remove hydrocarbons from the marine environment.	Combustion	**Not feasible** due to the fate and behaviour (high volatility and spreading) of condensate.	X	**Not feasible** due to the fate and behaviour (high volatility and spreading) of MDO.	X

Response Strategy	Description	Tactics	Strategic NEBA Decision			
			LOWC		MDO	
			Feasibility and ALARP Analysis	NEB	Feasibility and ALARP Analysis	NEB
Shoreline Protection and Deflection	Protect sensitive receptors by deflecting hydrocarbon away with booms and / or skimmers.	Nearshore booming & skimming	**Potentially feasible.** The maximum length of actionable shoreline oil is approximately 76 km with initial shoreline contact predicted to occur within 1.9 days of the release, with a maximum loading of 318.9 m^2. In the event that monitoring indicates shorelines are potentially exposed to actionable levels of hydrocarbons, and accessible to response personnel and equipment, the protection and deflection may be effective. Given Conoco Phillips Australia has access to both AMOSC equipment and Core Group personnel for timely deployment as per Tactical Response Plans, no further controls have been identified.	✓	**Potentially feasible**. The maximum length of actionable shoreline oil is approximately 14 km with initial shoreline contact predicted to occur within 1.5 days of the release, with a maximum loading of 47.4 m^2. In the event that monitoring indicates shorelines are potentially exposed to actionable levels of hydrocarbons, and accessible to response personnel and equipment, the protection and deflection may be effective. Given Conoco Phillips Australia has access to both AMOSC equipment and Core Group personnel for timely deployment as per Tactical Response Plans, no further controls have been identified.	✓
Shoreline Clean-up	Reduce additional impacts to shoreline habitats and the flora and fauna they contain.	Shoreline Clean-up & Assessment (SCAT) Manual Machinery Flushing	**Potentially feasible.** The maximum length of actionable shoreline oil is approximately 76 km with initial shoreline contact predicted to occur within 1.9 days of the release, with a maximum loading of 318.9 m^2. The nature of the gas condensate means that it is difficult to collect and clean from shorelines, therefore the tactics effectiveness is unknown. Considered feasible. In the event of shoreline impact, appropriate shoreline clean-up tactics could be implemented to reduce the impact to the shoreline habitats and species. Note: specific techniques to be decided following the completion of an operational NEBA in consultation with relevant stakeholders and under the direction of the relevant Control Agency. Given ConocoPhillips Australia has access to both AMOSC equipment and Core Group personnel for timely deployment as per Tactical Response Plans, no further controls have been identified.	✓	**Potentially feasible.** The maximum length of actionable shoreline oil is approximately 14 km with initial shoreline contact predicted to occur within 1.5 days of the release, with a maximum loading of 47.4 m^2. Considered feasible. In the event of shoreline impact, appropriate shoreline clean-up tactics could be implemented to reduce the impact to the shoreline habitats and species. Note: specific techniques to be decided following the completion of an operational NEBA in consultation with relevant stakeholders and under the direction of the relevant Control Agency. The nature of the MDO means that it is difficult to collect and clean from shorelines, therefore effectiveness is unknown. Given ConocoPhillips Australia has access to both AMOSC equipment and Core Group personnel for timely deployment as per Tactical Response Plans, no further controls have been identified.	✓
		Exclusion barriers	**Feasible**.	✓	**Feasible**.	✓

Response Strategy	Description	Tactics	Strategic NEBA Decision			
			LOWC		MDO	
			Feasibility and ALARP Analysis	NEB	Feasibility and ALARP Analysis	NEB
Oiled Wildlife Response (OWR)	Reduce the impact to wildlife – prior or post oiling has occurred.	Hazing Pre-emptive Capture Capture, Treatment and Rehabilitation	Limited wildlife impact is expected within the offshore environment; potentially individual seabirds may become oiled. However, some oiling of wildlife may occur along the maximum predicted 76 km length of coast exposed to moderate loading thresholds. Effectiveness depends on affected species and habitat type. Specific techniques to be decided following the completion of an operational NEBA in consultation with relevant stakeholders and under the direction of the relevant Control Agency. In the event of potential or observed wildlife impact, appropriate OWR tactics should be implemented to reduce the possibly impact to wildlife.		Limited wildlife impact is expected within the offshore environment; potentially individual seabirds may become oiled. However, some oiling of wildlife may occur along the maximum predicted 14 km length of coast exposed to moderate loading thresholds. Effectiveness depends on affected species and habitat type. Specific techniques to be decided following the completion of an operational NEBA in consultation with relevant stakeholders and under the direction of the relevant Control Agency. In the event of potential or observed wildlife impact, appropriate OWR tactics should be implemented to reduce the possibly impact to wildlife.	
Waste Management	Ensures waste generated from spill response activities is safely and adequately removed.	Waste Management Arrangements	**Feasible**. Standard industry requirement. Third-party contractor will develop a waste management plan and remain responsible for all waste removal activities. Given ConocoPhillips Australia has pre-identified potential waste contractors to be used in the event of an incident for timely deployment of personnel and equipment, no further controls have been identified.	✓	**Feasible**. Standard industry requirement. Third-party contractor will develop a waste management plan and remain responsible for all waste removal activities. Given ConocoPhillips Australia has pre-identified potential waste contractors to be used in the event of an incident for timely deployment of personnel and equipment, no further controls have been identified.	✓
Operational and Scientific Monitoring Program (OSMP)	Operational and scientific monitoring provides feedback into the response strategies, and indication of recovery and remediation efforts following a hydrocarbon spill event.	Operational and Scientific Monitoring Program (Studies)	**Feasible**. Standard industry requirement. Third-party contractor will develop an Operational and Scientific Monitoring Program (OSMP) and remain responsible for maintaining capability, equipment and resourcing and implementing the monitoring plans after activation from the Control Agency in the event of a spill event. Exchange of information will take place between the OSM contractor and the relevant control agency.	✓	**Feasible**. Standard industry requirement. Third-party contractor will develop an Operational and Scientific Monitoring Program (OSMP) and remain responsible for maintaining capability, equipment and resourcing and implementing the monitoring plans after activation from the Control Agency in the event of a spill event. Exchange of information will take place between the OSM contractor and the relevant control agency.	✓

7.8.3. Hazard

Activities required to conduct the response strategies may include:

- Vessel operations
- Aircraft operations
- MODU operations
- Drilling activities (i.e. relief well drilling)
- Shoreline activities
- Wildlife operations (e.g. handling, cleaning, rehabilitation), and
- Waste removal.

7.8.4. Source of Risk

7.8.4.1. Source Control

Source control tactics for consideration in this plan include:

- ROV Emergency BOP Intervention
- Independent Well Control Device – if deemed suitable through engineering assessment
- Relief Well
- Subsea First Response Toolkit
- Vessel Source Control

ROV Emergency BOP Intervention

Emergency BOP activation involves delivering hydraulic fluid to the BOP stack using an ROV to mitigate any problems that may have arisen with the BOP control system in a loss of well control event.

Independent Well Control Device

The Independent Well Control Device involves the remote activation of specialist pre-installed (prior to activity commencement) equipment which sits below or within the BOP ram and uses hydraulic pressure to seal off the damaged BOP and stop the flow of hydrocarbons.

Relief Well

The drilling of a relief well provides an opportunity to permanently suspend the well. A relief well is drilled to intersect the compromised well bore above the blowout location. Weighted drill fluid is pumped down the relief well at high rates to kill the existing well. This requires the mobilisation of another suitable MODU to the existing well location.

Relief Well Scope

The scope of drilling a relief well is the same as drilling a standard well although it will be a deviated well due to the need to drill at distance from the original flowing well. A relief well is typically drilled as a straight hole down to a planned kick-off point, where it is turned towards the target using directional drilling technology and tools to get within 30 - 60 m of the original well. The drilling assembly is then pulled from hole and a magnetic proximity ranging tool is run on wireline to determine the relative distance and bearing from the target well. Directional drilling continues with routine magnetic ranging checks to allow for the original well to be intersected. Once the target well is intersected dynamic kill commences by pumping kill weight mud and cement downhole to seal the original well bore.

Planning for the relief well will begin simultaneously with other well intervention options. Outline relief well plans and methodology are contained in the activity SCERP. This plan details the process for relief well design with key activities prioritised as part of the immediate response operations:

- Mobilisation of well control and relief well specialists.

- Confirmation of relief well strategy with well specialist to define MODU/vessel requirements:
- Confirm relief well location using geophysical site survey data. This will consider the prevailing weather at the time of the incident, seabed infrastructure in the area and directional drilling requirements for well intersection.
- Validate relief well casing design.
- Screen available MODUs in the region with current Australian Safety Case and select MODU with appropriate technical specifications to execute the strategy. A memorandum of understanding has been established between Australian operators (including ConocoPhillips Australia) to expediate access to suitable MODUs, equipment and services for relief well drilling. If required ConocoPhillips Australia is able to request the use of a MODU, equipment and services, that may be under contract to another operator. Minimum technical specifications for the well kill are assessed in the Blowout and Kill Simulation Report, the selected MODU will meet these requirements and be capable of operating in the metocean conditions at the relief well location.
- Prepare and submit regulatory documentation required for relief well activities, and
- Mobilise necessary equipment and services such as directional drilling equipment and appropriate ranging tools for relief well strategy.

Relief Well Design

The SCERP and relief well plan includes technical details as to the design and equipment requirements to drill a relief well. Detailed well kill modelling has demonstrated that the activity wells can be killed via a single relief well.

The relief well location is based on a safe anchor distance from the gas cloud. The relief well surface location is recommended to be approximately 800 m south-west of the target well location. The final relief well location will be based on actual site survey information, the location of any debris (or anchors) on the seafloor and the size of the gas cloud. The location of the relief well is positioned to ensure the relief well MODU is upwind for as much time as possible to limit potential exposure to hydrocarbons from the LOWC.

The relief well can be executed using a semi-submersible MODU (moored) similar to that used for drilling the exploration wells. Moorings are expected to extend approximately 2 km from the MODU and may therefore extend beyond the distance of the EP Activity operational area, which may expand by approximately 1-2 km radius under emergency conditions. The final anchor layout will be based on mooring analysis and rig configuration.

At least two Anchor Handling Tug Supply (AHTS) vessels would be required to tow the MODU (if unable to self-propel) and install moorings. An active MODU would already be supported by AHTS vessels and hence would likely be accompanied by those vessels during relief well drilling. AHTS vessels could also be sourced from hubs such as the Northwest shelf and Singapore.

The subsurface target will be at or below the 9 5/8” casing shoe. The 9 5/8” casing in the target well will be used as the ranging point whilst honing into the target well. Options for an open hole or cased hole intercept will be assessed based on the actual target well architecture and situation. An open hole intercept just below the 9 5/8” casing shoe is the primary option. Several passes (each pass may be a side-track) of the 9 5/8” casing may be required to narrow down the final target well location.

Dynamic kill modelling has been performed based on the worst-case discharge of 540 MMscf/d of gas and 10,799 bbls/d of condensate. A dynamic kill can be achieved with one relief well. The dynamic kill requirements are based on the following relief well specifics:

- 9 5/8” casing set just above the final intercept point
- 5 ½” drill pipe in the relief well
- 3 ½” choke and kill lines

The dynamic kill results demonstrate that most options are achievable with three 1600 hp pumps and one requiring four 1600 hp pumps.

The basic design is for a directional relief well targeting the open hole of the target wellbore would comprise of:

- 660 x 1067 mm (26" x 42") conductor hole drilled to approximately 45-60m below seabed - sufficient depth as required for conductor loading and fatigue mitigation. 914 mm (36") conductor will be installed and cemented to seabed.
- 445 mm (17-1/2") surface hole directionally drilled riser-less to approximately 530 m TVDRT in Gillibrand Marl before running 340 mm (13-3/8") surface casing, the well will be kicked off to achieve initial build up to the target sail angle.
- 311 mm (12-1/4") hole directionally drilled with BOPs installed to approximately 1,950 m TVDRT before running 244 mm (9-5/8") intermediate casing. The sail angle from the surface casing shoe is approximately 50° degrees until reaching proximity of the target well and dropping to inclination at TD approximately 3° with the relief well casing point next to the target well, giving 900 m of open hole below the casing shoe intersect the target wellbore.
- 216 mm (8-1/2") hole drilled up to TD of approximately 1,970 m TVDRT, where an intercept with the open hole is expected.

MODU Mobilisation

Typically, multiple semi-submersible MODUs capable of drilling relief wells are operating within Australian waters. Higher activity is typical in the Northwest shelf, though drilling MODU's have also been active in the south-eastern region.

For planning purposes ConocoPhillips Australia assesses four mobilisation scenarios for sourcing a relief well MODU:

1) Regional semi-submersible MODU in Victorian waters.
2) Northwest shelf semi-submersible MODU in West Australian waters.
3) International (Asia) semi-submersible MODU in Singapore waters.
4) International (Pacific) semi-submersible MODU in New Zealand waters.

Any MODU that is to be considered for a relief well must have an approved Safety Case and mobilisation from the Northwest shelf represents the most likely case as this stage.

MODU Mobilisation from Victorian Waters

The local scenario has been developed to assess a technically capable and locally available semisubmersible MODU in the offshore Victoria area. Transit time is improved for the local case when compared to the other scenarios. A suitable local rig would be the preferred option during a relief well operation but may not be selected for several reasons, for example:

- Lack of appropriate MODU capabilities to drill and kill the well
- Response timeframes favours selection of alternate MODU (Complex scope to suspend well and demobilise from local location, stacked or requirement for hull inspection prior to mobilisation)
- MODU unable to be released due to restrictions (such as well control event, equipment failure, weather, regulator enforcement etc.)
- No MODU available locally during activities.

The Victorian offshore oil and gas sector is serviced sporadically by semi-submersible MODUs with Title holders mobilising more frequently to NWS (Mid case) from Asia. Therefore, should a relief well MODU be required it will likely be mobilised from either the Northwest shelf or Asia. Response time estimates have been developed and will continue to be reviewed and updated to reflect the most favourable case mobilisation of relief well MODU to the relief well location.

MODU mobilisation from Northwest Shelf in West Australian waters.

This scenario has been developed to assess bringing in a suitable MODU from the Northwest Self (NWS) (location Exmouth). This may be due to a number of reasons for example:

- No active suitable working MODU in local Victorian waters.
- Deficient MODU capabilities to drill and kill the well.
- MODU unable to be released due to restrictions (such as biosecurity, well control event, equipment failure, weather, regulator enforcement etc.).
- Complex scopes to suspend well and demobilise from location i.e. deep-water mooring recovery.

The Exmouth point of departure for the mobilisation is a nominal position in the Northwest shelf; a MODU further North in the area would require additional transit time. However, this would not be excessive or warrant a separate response timeframe estimate. The Northwest shelf is the presently the main activity hub for oil and gas operations in Australia, multiple companies have continuous MODU operations on the Northwest shelf. Hence the area is likely to hold multiple options for securing relief well semi-submersible MODU. Additionally, transit time is improved when compared to the base case transit time.

MODU mobilisation from international waters (Singapore)

The international case model has been developed to assess mobilising a suitable MODU from outside of Australian waters. This is considered unlikely, but theoretically could occur in the event that:

- No active working MODU in Australian waters.
- Deficient MODU capabilities to drill and kill the well.
- MODU unable to be released due to restrictions (such as biosecurity, well control event, equipment failure, weather, regulator enforcement etc.).
- Complex scopes to suspend well and demobilise from location i.e. deep-water mooring recovery.

While other suitable MODU options are likely available closer to the relief well site there should not be a requirement to look further than the area of Singapore which continually services the oil and gas and maritime industries. The base case transit time is the longest of all cases presented and is considered to be of low credibility. Additionally, the selected MODU should have a current Australian Safety Case and no restrictions to enter the county.

MODU mobilisation from international waters (New Zealand)

The mobilisation case of a relief well semi-submersible MODU from New Zealand has been reviewed and should a suitable MODU be available it would also be considered as part of the relief well planning. Access to MODU in New Zealand would depend on MODU contract commitments at the time and Titleholder / Joint Venture and MODU owner willingness to release MODU, and the existence of a valid Australian Safety Case.

Relief Well Installation Timeline

The relief well timeline is largely guided by the location of mobilisation of the rig drilling the relief well. The three mobilisation points considered are outlined previously.

The timeline to achieve an intercept and kill the target well is based on all ranging operations occurring in the 12-1/4” hole section. There is an allowance for nine ranging runs and two sidetracks to position the 9-5/8” casing in the relief well adjacent to the 9-5/8” casing in the target well. The intercept is anticipated to occur in the 8-1/2” open hole section. Once communication with the target well is established the dynamic kill operations will commence.

ConocoPhillips Australia has estimated the following timeframes to complete a relief well installation and well kill scope (see Table 7-42).

Table 7-42: Relief well installation timeline

Activity Description	Timeline from Mobilisation Scenario (estimated days)		
	International: Singapore	**National: Northwest Shelf**	**National: Victoria**
Activation phase			
Activate Well Control Team, commence planning and notifications	2	2	2
Select MODU, inspect and complete contracting work scope	7	7	7
Demobilise equipment from MODU	2	2	2
Retrieve anchors and commence MODU move preparations	2	2	2
MODU Transit to Site			
MODU mobilisation to relief well location	47.4	25.7	8.9
Relief Well Operations			
Run anchors and position MODU	2	2	2
Equipment mobilisation	1	1	1
Prepare to Spud	0.6	0.6	0.6
Drill 26” x 42” Hole Section	0.6	0.6	0.6
Run and cement 36” Conductor	1.2	1.2	1.2
Drill 17-1/2” Hole Section	1.5	1.5	1.5
Run and cement 13-3/8” Casing, Install BOP and Test	3.6	3.6	3.6
Directionally Drill 12-1/4” Hole Section – include ranging and two sidetracks	29.5	29.5	29.5
Run and cement 9-5/8” Casing	5.4	5.4	5.4
Drill 8-1/2” Hole to intercept	1.2	1.2	1.2
Well kill operations (two attempts)	2.4	2.4	2.4
Time to Drill Relief Well and Kill Blowout (days)	**109.4**	**87.7**	**70.9**
Abandon Relief Well and target Wells			
Plug and abandon well(s)	6.5	6.5	6.5
Retrieve anchors and demobilise MODU	2	2	2
Total relief well duration (days)	**117.9**	**96.2**	**79.4**

Regulatory Approval Timing Considerations

Planning for relief well drilling will occur in parallel to other tertiary well control responses. A key component of the relief well drilling will be the preparation, submission, and approval of the regulatory documents. Generally, for well operations the regulatory and risk management processes fall on critical path hence in an emergency these documents will require a high level of focus immediately to ensure they are in place prior to arrival of the MODU.

The following documents will require consideration:

- Vessel safety case - for the selected MODU.
- Scope of validation - is required by NOPSEMA for any proposed significant change to an offshore facility (i.e. MODU or Vessel) and to be agreed prior to submission of a safety case revision. Depending on the level of changes the time to complete and gain approval could possibly affect the response time to have regulatory documentation in place prior to start of relief well operations.
- Safety case revision- will require preparation, submission and approval prior to operations and is expected to be on critical path for relief well activities.

- Well Operations Management Plan (WOMP) –is expected to be suitable for relief well drilling and not expected to require a revision and resubmitted.
- Environmental Plan (EP) –is designed to provide for source control response activities. Significant changes may require resubmission subject to initial change assessment, though is not expected to affect overall response time.
- Well activity notice.

As part of the preparation of the above documentation a number of formal safety assessments will be conducted as part of risk management these include:

- Hazard Identification (HAZID) workshop (identity's risks, assesses hazards and mitigations to control works site hazards with aim to remove major accident events).
- Hazard Operations (HAZOP) workshop (risk assesses the operational sequence and place controls to reduce hazards to ALARP).
- Risk Assessments for safety critical equipment (Vessel Equipment, BOP, Mooring, Fluids Handling).

Response Agreements

ConocoPhillips Australia maintains contracts/agreements with specialist resources to supply well control expertise and support for drilling a relief well. This includes:

- Well engineering support services such as Labrador Petro-Management and Wild Well Control.
- Technical writing and risk engineering services to support regulatory documentation workflows and submissions is provided by experienced specialists such as ADD Energy.
- Wild Well Control: Well control specialists with experience in relief wells and the coordination of installation activities.
- Wellhead and casing materials supplier.
- ConocoPhillips Australia is party to the Industry Memorandum of Understanding (MoU) to share drilling rigs, equipment and resources (well site services) in the event of an emergency. The MoU provides for the timely transfer of third-party contractual arrangements involved in the release of a MODU and well site services to the Titleholder for relief well drilling.
- Equipment and materials needed to construct a relief well will be able to be sourced either directly from suppliers or through the industry APPEA Mutual Aid MoU. All equipment and materials are tracked and identified prior to the commencement of the offshore activity through the "relief well readiness form" process (refer to OPEP, Appendix I). All equipment and materials are expected to be sourced and transported to site during the safety case revision approval timeframe, MODU transit and anchoring phase for the base and mid case response time model estimates. For the local MODU mobilisation case; an operational MODU would also have equipment and services, with additional equipment and services available via APPEA MoU.
- ConocoPhillips Australia will conduct a relief well readiness check and engage Titleholders to ascertain and confirm the level of critical equipment inventories during the operational period for the purpose of drilling a relief well.

In addition, equipment available from local titleholders will be assessed prior to operations and opportunities to formalise sharing of locally based resources will be undertaken.

MODU activity outlook and monitoring

ConocoPhillips Australia tracks MODU's and vessels at a global level through its subscription to RigLogix and ODS Petrodata databases. At a business unit level, the tracking of rigs is performed by contacting current rig operators to determine the status of the MODUs and how quickly they could be released if required to respond to an emergency. The same applies for support vessels.

Subsea First Response Toolkit

The need for debris removal will be dependent upon the scenario, damage to the subsea facilities such as subsea well components, MOU riser and well control equipment. Debris clearance may involve the use of ROVs and cutting equipment to ensure a clear path for manual intervention.

Response specialists such as AMOSC, Oceaneering and Wild Well control can provide equipment packages. ConocoPhillips Australia is a member of AMOSC, who maintain the Subsea First Response Tool Kit (SFRT) located in Jandakot, Western Australia.

Source Control Incident Management Team (IMT)

The source control team sits within ConocoPhillips Australia's IMT. The Source Control Branch Director reports directly to the Operations Section Chief within the IMT. The simultaneous operations (SIMOPS) group from the source control team reports to the Planning Section Chief and the Logistics Section Chief within the IMT. The incident Commander (IC) is responsible for all response activities that occur, including source control operations.

Source Control IMT Structure

Figure 7-7 details the source control team structure. This structure will be adapted depending on the response scenario and the response capability required at the time of the response.

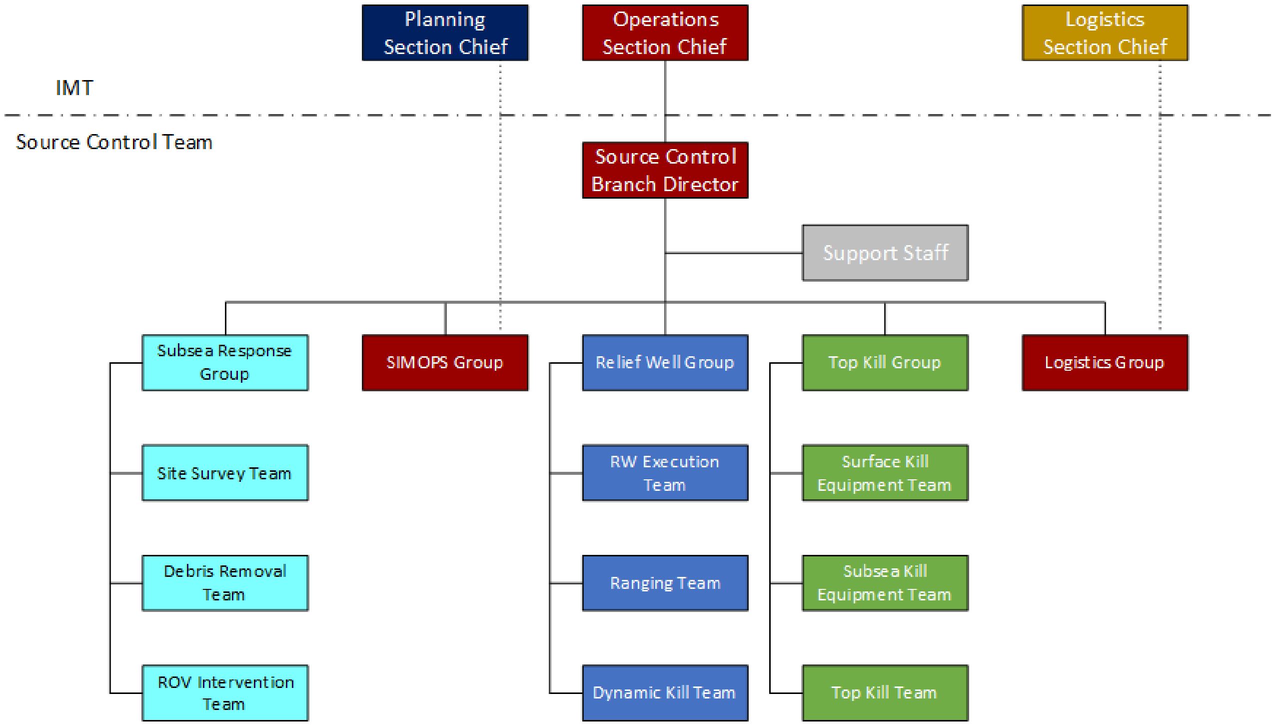


Figure 7-7: Source control team structure

Roles and Responsibilities

Table 7-43 summarises the roles and responsibilities of the Source Control Team.

Table 7-43: Source control IMT roles and responsibilities

Role	Responsibility
Source Control Branch Director	The Source Control Branch Director is a member of the Operation Section and is responsible for the management, implementation, and coordination of all operations and plans directly related to controlling the source (well).
Subsea Response Group Leader	The Subsea Response Group Leader is responsible for the Sub Sea Well Containment Group, which oversees planning and conducting subsea containment operations. The Subsea Response Group Leader will interface with the SIMOPS Group Leader for concurrent operations and the Logistics

	Group Leader for the mobilization of equipment and response assets. They will stand-up all three subsea response groups (Sub Sea Well Containment Group, SIMOPS Group, and the Logistics Group) initially and then stand down work streams as the situation allows.
Relief Well Group Leader	The Relief Well Group Leader is responsible for planning, designing and execution of the relief well/s and well kill programme to regain control of the blowing well. The Relief Well Group coordinates the development of the drilling plan and drilling procedures, secures resources, and manages relief well operations to ensure the source is controlled. The Relief Well Group will obtain all required regulatory approvals for drilling and coordinate SIMOPS with other concurrent operations.
Top Kill Group Leader	The Top Kill Group Leader will be responsible for executing a top kill operation if the well is found to be shut in, either with the subsea BOP or with the pre-installed capping stack. The Top Kill Group consists of a surface kill team responsible for a vessel based well kill operation, a subsea equipment team responsible for the connection of the well to the vessel based well kill equipment, and a top kill team responsible for a well kill from the rig (if the rig remains connected to the subsea BOP).
Simultaneous Operations (SIMOPS) Group Leader	The SIMOPS Group Leader reports to the Source Control Branch Director and to the Planning Section Chief (if required). The SIMOPS Group has the responsibility and authority to prioritize and schedule all simultaneous operations and activities necessary to coordinate, organize, and conduct control activities in and around the designated area of operations during source control activities. The SIMOPS Group will coordinate the activities of debris removal, ROV operations, and vessel operations. The SIMOPS Group must work closely with all Source Control groups.
Logistics Group Leader	The Logistics Group Leader Provides logistical support for the sourcing and mobilisation of all equipment required to regain control of and kill the well.

Source Control Arrangements

ConocoPhillips Australia has contracts with source control specialists, such as Labrador Petro-Management, Wild Well Control, AMOSC and Gunnar Energy Services, which will be contacted in the event of a hydrocarbon release to ensure a timely source control response.

Labrador Petro-Management can provide specialise advice and support for well control and well operations, such as well intervention planning and execution. Wild Well Control can provide specialist services such as: well control advice, relief well planning and execution support, and dynamic kill modelling and execution. AMOSC maintain the SFRT with Oceaneering and Gunnar Energy Services can provide ranging services.

The activation and duty officer numbers are located within ConocoPhillips Australia's Crisis Management and Emergency Response IMT Roster.

Vessel Source Control

Vessel source control actions are those in accordance with the vessel's SOPEP (or equivalent) and dependent on the scenario type. Vessel source control may include transfer of the fuel from damaged tanks to another vessel and repairing the tank.

7.8.4.2. Surveillance, Modelling and Visualisation (SMV)

Surveillance, Modelling and Visualisation (SMV) is conducted to assist in identifying resources that are at risk of exposure, directing response efforts and evaluating the effectiveness of response techniques. SMV activities are conducted throughout the incident response. The SMV tactics that may be used to evaluate the parameters and potential trajectory of the spill may include:

- Oil Spill Trajectory Monitoring – manual vectoring and software (e.g. ADIOS) to predict the weathering and trajectory of the hydrocarbon.
- Oil Spill Trajectory Modelling (OSTM) – computer models, and computational techniques estimate the speed and direction of movement, weathering, and dispersal patterns.
- Visual Surveillance (aerial/vessel) – observers on aircrafts or vessels use standard references to characterise surface oil type, movement, and behaviour.
- Satellite Tracking Drift Buoys – are heavy duty floating devices designed for deployment from MODUs, support vessels and helicopters to accurately track a surface hydrocarbon spill. Tracking buoys contain a

global satellite tracking system and are used to track the leading edge or centre of a spill and provide an oil spill response team with information to plan the incident response.
- Satellite Imagery – a method that uses remote sensing technologies to identify and track surface oil.

7.8.4.3. Shoreline Protection and Deflection (P&D)

Shoreline P&D operations will be under the direction of the relevant Control Agency and involve using specialist equipment (e.g. nearshore booms and skimmers) to divert floating oil away from pre-identified sensitive receptors. Techniques vary depending on the location and type of sensitivity being protected. The requirement for response personnel to access the shoreline (i.e. via foot, vehicle, vessel) to be protected, and the implementation of an anchoring system for the nearshore booms (i.e. on the shoreline and / or in the nearshore environment) will cause a potential impact to the environment.

7.8.4.4. Shoreline Assessment and Clean-up

Shoreline operations will be under the direction of the relevant Control Agency. The Control Agency is determined based on the source of the spill and whether the spill takes place in or has entered Commonwealth or State waters. Control Agencies for the spill scenarios considered for the activities within this EP are outlined in the OPEP (Appendix I).

Shoreline Assessment and Clean-up (often termed SCAT) involves the deployment of personnel to relevant shorelines to identify response priorities, access points and techniques required. Shoreline clean-up may involve different manual and mechanical recovery techniques to pre-clean shorelines pre-impact and remove oil and contaminated debris from the shoreline post-impact to reduce environmental impact from stranded, typically weathered, hydrocarbons. Resourcing and equipment details are provided in the OPEP (Appendix I).

Shoreline clean-up operations are typically considered in three stages:

- Stage 1: Bulk oil is removed from the shore to prevent remobilisation.
- Stage 2: Removal of stranded oil and oiled shoreline material.
- Stage 3: Final clean-up of light contamination and removal of stains.

The shoreline techniques which may be required to complete these stages include:

- Natural recovery – no intervention i.e. allowing shoreline to clean itself (surf washing).
- Manual collection of oil and debris – use of personnel (e.g. shovels, rakes).
- Mechanical collection of oil and debris – use of machinery.
- Flushing– use of high-pressure (on artificial substrate only) and low-pressure water flushing techniques to wash stranded or buried oil from shorelines.
- Recovery – use of specialist equipment (e.g. skimmers, pumps, vacuums) to recovery floating oil.
- Vegetation clearing – removal contaminated vegetation.
- Cleaning agents – application of chemicals to remove oil (often only applicable for artificial substrates).

7.8.4.5. Oiled Wildlife Response (OWR)

The accidental release of hydrocarbons into the marine environment has the potential to impact wildlife. The level of oiled wildlife response (OWR) will be determined by data collected via the initial SMV tactics. The OWR will be conducted in accordance with the state specific marine oil and chemical spill contingency plans and relevant wildlife response plans, as directed by the state control agency/ies.

Typical OWR can be separated into three stages, including:

1) Wildlife Reconnaissance - situational awareness / visual observations of species present and identification of species that may potentially be impacted by vessel, aircraft, vehicle, AUV or foot.
2) Preventative Actions:
   a) Deterrence strategies (e.g. hazing by auditory or visual scarers)

   b) Displacement strategies (e.g. fencing or barricading techniques)
   c) Pre-emptive capture - removal of wildlife from an area and transportation to a staging facility or to an adequate area not expected to be impacted.
3) Wildlife Rescue:
   a) Capture of oiled wildlife – action only to be completed by trained wildlife handlers at direction of relevant control agency.
   b) Transportation to field processing facility and / or primary care facility staging.
   c) Triage – undertaken by trained veterinarians (euthanasia may be required).
   d) Stabilisation – of wildlife prior to cleaning.
   e) Cleaning – rinsing, washing, drying to remove contamination.
   f) Rehabilitation – feeding, swimming, waterproofing, conditioning, pre-releases assessment.
   g) Release – once approved.

7.8.4.6. Waste Management

Hydrocarbon spills to the marine environment can generate significant amounts of waste that need to be collected, stored, and disposed of appropriately, in accordance with MARPOL 73/78 Annex V – Garbage, relevant Commonwealth and State/Territory laws and regulations.

Due to the high volatility nature of both hydrocarbon types (MDO and condensate), and their subsequent susceptibility to weathering processes (i.e. evaporation) significant volumes of waste are not anticipated. Furthermore, containment and recovery has not been identified as a primary or secondary strategy for either the condensate or MDO scenario meaning the waste storage capacity required is likely to be small. Waste management arrangements will be implemented prior to activity commencement and will need ensure a continuous response can be maintained.

7.8.4.7. Operational and Scientific Monitoring

ConocoPhillips Australia have developed an Operational and Scientific Monitoring Program (OSMP) to meet the requirements of the Environment Regulations. The OSMP is the principle tool for determining the extent, severity and persistence of environmental impacts from an oil spill, and allows titleholders to determine whether their environmental protection goals are met. Operational monitoring can be used to assess how effective the oil spill response is in protecting the environment. Whereas scientific monitoring can be used to direct remediation efforts, typically after the spill response activities are completed.

OSMP techniques vary, depending on the type of spill, location and status of the response. The use of vessels, aircraft and shoreline responders (on foot, vehicles) may be required to undertake the techniques identified within the OSMP.

7.8.5. Potential Environmental Impacts

Aspects of spill response activities have the potential to impact the environment, including from:

- Light emissions – MODU and vessel operations, aircraft and shoreline operations
- Underwater sound emissions – vessel and MODU operations
- Atmospheric emissions – vessel and MODU activities
- Discharge of waste – vessel and MODU operations
- Drilling discharges – activities associated with drilling a relief well
- Interaction with marine fauna – vessel, aircraft, MODU, shoreline and wildlife operations, and
- Shoreline disturbance (including seabed and intertidal) – shoreline activities.

These aspects can result in a range of potential impacts, including:

- Injury / mortality to fauna
- Change in fauna behaviour
- Change in habitat, such as:

    - Temporary increase in sedimentation and turbidity
    - Alteration of seabed habitat
    - Habitat smothering
- Changes to the functions, interests, or activities of other users, and
- Changes to cultural values.

7.8.6. Defining the Environment that May Be Affected (EMBA)

Table 7-44 describes how the EMBA has been defined for the receptors and impacts that have been identified to be potentially impacted by spill response activities.

Figures 7-1 to 7-3 (EP Section 7.6) show the EMBAs for Marine Diesel Oil, and Figures 7-4 to 7-6 (Section 7.7) show the EMBAs for LOWC generated by overlaying the modelling outputs from hundreds of hypothetical worst-case credible spill scenarios for T/49P, and the southern and northern extents of VIC/P79 respectively. These figures in no way represent the extend of any individual spill but rather provides a basis for response planning. Note: the moderate threshold determines actionable response areas, and low threshold determines required monitoring areas.

Table 7-44: EMBA for spill response activities

Aspect	EMBA	Basis of EMBA	Source	Spatial Extent
Oil Spill Response	Spill EMBA	The EMBA has been defined on the basis that spill response activities may occur anywhere in the moderate threshold spill EMBAs defined for T/49P and VIC/P79 in the northern and southern extents (see Figures 7-1 through to 7-6 in Sections 7.6 and 7.7).	AMSA National Plan for Marine Pollution Emergencies.	Spatial extent of stochastic spill modelling based on moderate threshold for surface, shoreline, dissolved and entrained hydrocarbon. Note moderate threshold indicates areas of actionable oil response and low threshold indicates areas of actionable monitoring (i.e. OSMP).

7.8.7. Potentially Affected Values and Sensitivities

ConocoPhillips Australia considers the particular values and sensitivities relevant to the assessment of risks associated with spill response activities, as per the EPBC Act and the Environment Regulations, to be:

- Presence of Listed threatened species and ecological communities
- Presence of Listed migratory species (protected under international agreements)
- Values and sensitivities as part of the Commonwealth marine environment
- Values of World heritage properties
- Values of National heritage places
- Ecological character of a declared RAMSAR wetland
- Other values including social, economic and cultural values.

These requirements are described in Section 5.4.2 of this EP.

Receptors known to be present within the identified spill EMBAs are described in detail in Section 4 (Description of the Environment).

7.8.8. Consequence Evaluation

The impacts and risks associated with vessel, aerial and MODU operations undertaken to support spill response activities have been assessed in detail in previous EP sections, including:

- Interference with Other Marine and Coastal Users - Section 6.2
- Seabed Disturbance – Section 6.3
- Light Emissions – Section 6.4
- Atmospheric Emissions – Section 6.5
- Underwater Sound – Non-Impulsive – Section 6.6
- Underwater Sound – Impulsive – Section 6.7

- Planned Drilling Discharges – Section 6.8
- Planned Operational Discharges – Section 6.9
- Loss of Materials or Waste Overboard – Section 7.2
- Minor Loss of Containment – Section 7.3
- Interaction with Marine Fauna – Section 7.4
- Introduction of IMS – Section 7.5
- Marine Diesel Oil Release – Section 7.6
- Loss of Well Control – Section 7.7

The consequence evaluation for this section focuses on potential impacts specific to spill response activities, which have not already been covered by the above sections.

7.8.8.1. Ecological Receptors

Potential impacts from a shoreline response (assessment, protect and deflect, and clean-up) will vary depending on the method used, the location and the type of shoreline being affected. The response may result in damage to and/or loss of shoreline habitats, disturbance or injury/mortality of fauna, or the alteration of fauna habitats.

For example, vessels may be required to deploy booms within shallow nearshore environments, increasing the risk of sedimentation and smothering of habitats and communities; whereas the use of anchors for shoreline booms may damage the nearshore or estuarine habitat (i.e. seagrass), affecting the fauna which utilise it.

Shoreline response requires access of responders and equipment to the impacted area. Loss of vegetation and damage to shoreline habitats (e.g. dunes) may occur where existing tracks cannot be used, or do not exist. Implementation of a shoreline response increases the potential to disturb fauna within the area. Shoreline response may cause erosion (e.g. of dunes and sandy beaches), or the removal of sand (i.e. manual removal), which may potentially impact nests or nesting fauna.

The additional noise and general disturbance created by shoreline clean-up activities and increased vessel and aircraft activities could potentially disturb the feeding, breeding, nesting or resting activities of resident and migratory fauna species that may be present (such as shorebirds and seabirds).

In the event that an oiled wildlife response is required, i.e. where the Operational NEBA demonstrates a net benefit, risks to fauna would predominantly be associated with the use of untrained resources to capture and handle the fauna potentially resulting in distress, injury or death.

Any impacts are likely to be highly localised to the response infrastructure, vessel or shoreline response operational area and only result in localised, medium-term impacts to species or habitats.

The inherent consequence severity of spill response activities on the ecological environment has been assessed as **Moderate (3)**, and the likelihood is assessed as **Remote (2)**, with the level of risk being **Medium (RR II)**, based on:

- Oiled wildlife response will only be implemented where the Operational NEBA determines a net positive outcome, and will be conducted using trained specialists, under the direction of the relevant Control Agency following the relevant State oiled wildlife plan.
- The identification of sensitive receptors present within impacted areas through the Operational NEBA will take place prior to implementation of any spill response strategy, allowing mitigation measures to occur (e.g. fencing off sensitive areas) to reduce the risk of response activities causing damage.
- Wildlife surveillance, fauna and flora impact studies, and remediation efforts will be carried out in accordance with the Operational and Scientific Monitoring Program (OSMP).
- Spill response activities will be carried out in accordance with a NOPSEMA approved OPEP (Appendix I), under the guidance of the National Plan (AMSA 2020) to ensure they are compliant with industry best practice and Australian legislation and requirements.

- Only trained response personnel from the Control Agencies, ConocoPhillips Australia, AMSA, AMOSC and subject matter experts will be used to implement the response strategies to ensure best practice is undertaken and the risks are reduced.
- The physical characteristics of MDO and gas condensate (light, low viscosity, and volatile) will result in a relatively large portion undergoing evaporation, dispersion and weathering, with only a comparatively small amount of weathered material expected to persist within the environment, therefore reducing the amount of potential intervention required by the spill response.
- There is a good understanding of potential impacts and risks from spill response activities, and the control measures required to manage these (see Appendix I for relevant Control Measures and Environmental Performance Standards).
- Potential impacts assessed for spill response activities are similar to those assessed for planned activities. Any additional impacts are only expected to cause localised, short-term impacts to ecological receptors.

7.8.8.2. Conservation Values and Sensitivities

The LOWC and MDO spill EMBAs overlap marine parks as shown in Table 7-45.

Table 7-45: Australian Marine Parks within the MDO and LOWC EMBA

Marine Park	Zone	MDO EMBA	LOWC EMBA
Apollo	Multiple Use Zone VI	✓	✓
Beagle	Multiple Use Zone VI	X	✓
Boags	Multiple Use Zone VI	✓	✓
Franklin	Multiple Use Zone VI	✓	✓
Nelson	Special Purpose Zone	X	✓
Tasmin Fracture	Marine National Park Zone	X	✓
Tasmin Fracture	Multiple Use Zone VI	X	✓
Zeehan	Special Purpose Zone	✓	✓
Zeehan	Multiple Use Zone VI	✓	✓

The LOWC EMBA overlaps 32 state reserves and the MDO EMBA overlaps 5 state reserves, including the Twelve Apostles Marine National Park and The Arches Marine Sanctuary. The conservation values of the commonwealth and state marine reserves are outlined in EP Sections 4.4.1 and 4.4.6. Where the conservation values of these reserves include fauna, these values have the potential to be impacted by oiled wildlife response. The consequence evaluation of the ecological environment has been assessed above in Section 7.8.8.1.

Two wetlands of International Importance (RAMSAR) (i.e. Lavinia and Glenelg estuary and Discovery Bay), six wetlands of National Importance (i.e. Pearshape Lagoon, Aire River, Merri River, Lake Flannigan, Princetown wetland, and Bunagree Lagoon), and several Threatened Ecological Communities (TECs) (i.e. coastal saltmarsh, coastal estuaries, forests and woodlands, grassland plains, and kelp forests) are overlapped by the spill EMBAs. Shoreline response activities (assessment, P&D and clean-up) and nearshore vessel activities may result in the potential damage, alteration and/or loss of these habitats. Spill response requires access of shoreline responders, vehicles, vessels and equipment into the impacted area which can cause permanent or temporary damage to habitat. For certain sensitive areas, leaving the oil to naturally disperse can cause less damage than undertaking a shoreline clean-up response.

The LOWC spill EMBA overlaps three Key Ecological Features (KEFs) (Bonney Coast Upwelling, the West Tasmania Canyons and the Upwelling East of Eden) which are defined as KEFs due to their metocean influence and high levels of productivity. The MDO spill EMBA only overlaps two of the KEFs (Bonney Coast Upwelling and the West Tasmania Canyons). No additional impacts to KEFs are expected from spill response activities, aside from those described within Sections 6 and 7 of this EP.

The inherent consequence severity of spill response activities on conservation values and sensitivities has been assessed as **Moderate (3)**, and the likelihood is assessed as **Remote (2)**, with the level of risk being **Medium (RR II)**, based on:

- Spill response activities will only be implemented in sensitive areas (i.e. marine reserves, coastal saltmarsh and wetlands) where the Operational NEBA determines a net positive outcome, with trained specialists operating under the direction of the relevant Control Agency.
- Shoreline access to conduct oil spill response activities would only be implemented in consultation with the Control Agency and other relevant agencies.
- The identification of sensitive receptors present within the impacted area through the Operational NEBA will take place prior to implementation of any spill response strategy, allowing mitigation measures to occur (e.g. fencing off sensitive areas) to reduce the risk of response activities causing damage.
- Spill response activities will be carried out in accordance with a NOPSEMA approved OPEP (see Appendix I), under the guidance of the National Plan (AMSA 2020) to ensure they are compliant with industry best practice and Australian legislation and requirements.
- There is a good understanding of potential impacts and risks from spill response activities, and the control measures required to manage these (see Appendix I for relevant Control Measures and Environmental Performance Standards).

7.8.8.3. Socio-economic Receptors

The presence of hydrocarbons on shorelines and associated monitoring, clean-up, and wildlife operations may require temporary assess restrictions resulting in changes to the functions, interests or activities of coastal users within impacted areas. Depending on location this may restrict access to recreational activities (such as swimming, walking, boating and recreational fishing) and tourism. Closure of affected areas will remain in place until access is permitted by local authorities.

An increase in vessel and aircraft operations is expected to occur during spill response activities, potentially impacting local coastal communities in the area.

Depending on the spill scenario, clean-up operations are expected to take anywhere from days, weeks to months following source control. The characteristics and properties of MDO and gas condensate will result in rapid weathering and low expected persistence within the environment. As such, impacts to socio-economic receptors are predicted to be localised and short-term.

The inherent consequence severity of spill response activities on the socio-economic environment has been assessed as **Minor (2)**, and the likelihood is assessed as **Remote (2)**, with the level of risk being **Low (RR I)**, based on:

- Shoreline access to conduct spill response activities and closure of impacted areas would only be implemented in consultation with the Control Agency and in other relevant agencies.
- Spill response activities will be carried out in accordance with a NOPSEMA approved OPEP (see Appendix I), under the guidance of the National Plan (AMSA 2020) to ensure they are compliant with industry best practice and Australian legislation and requirements.
- The identification of sensitive receptors present within impacted areas through the Operational NEBA will take place prior to implementation of any spill response strategy, allowing mitigation measures to occur (e.g. fencing off sensitive areas) to reduce the risk of response activities causing damage.
- The physical characteristics of MDO and gas condensate (light, low viscosity, and volatile) will result in a relatively large portion undergoing evaporation, dispersion and weathering, with only a comparatively small amount of weathered material is expected to persist within the environment, therefore the oil spill response is anticipated to not last longer than weeks to months.
- There is a good understanding of potential impacts and risks from oil spill response activities, and the control measures required to manage these (see Appendix I for relevant control measures and environmental performance standards).

- Potential impacts assessed for spill response activities are similar to those assessed for planned activities. Any additional impacts are only expected to cause localised, short-term impacts to socio-economic receptors.

7.8.8.4. Cultural Environment

During consultation, relevant persons provided feedback regarding potential impacts to cultural heritage values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).

Depending on the location of impact there is a potential that spill response activities may result in disturbance to the cultural values and sensitivities within the environment or may affect culturally important species. There are numerous areas containing shell middens (i.e. the remains of shellfish eaten by First Nations people) in the sand dunes, banks or cliff tops or as scatters of shell exposed on eroded surface along the coastal areas of South-east Australia (Biosis 2023). Charcoal and hearth stones from fires, and items such as bone and stone artefacts are often located within sheltered positions in the dunes, coastal scrub, and woodlands (NSR Environmental Consultants 2001). Hut depressions, and rock art pecked in stone, can be found on coastal margins, and an array of sacred sites and places can be found within Victoria and Tasmania (Biosis 2023), and across the South-east Australia (NOO 2002b).

Sea Country, like Country, is also of First Nations cultural heritage significance. There is no distinction between the land and the sea, as dreaming stories have been passed between First Nation communities, preserving the history, physical evidence, and connection to the previously occupied land before sea level rises (Biosis 2023). Furthermore, certain First Nations groups have a connection to waterways and waterbodies due to the water-based resources, fishing practices, and spiritual connections (Biosis 2023).

Movement of people, vehicles and equipment through impacted and nearby shoreline areas may disturb cultural heritage remains, artefacts, sites, and places that occur within the affected area or nearby. Disturbance or damage to such sites can be minimised by fencing off any identified areas and reporting any finds to relevant state agencies. Activities can also affect culturally important species resulting in injury or mortality to fauna or behavioural disturbance.

The inherent consequence severity of spill response activities on the cultural environment has been assessed as **Minor (2)**, and the likelihood is assessed as **Remote (2)**, with the level of risk being **Low (RR I)**, based on:

- Shoreline access to conduct spill response activities would be implemented in consultation with the Control Agency and relevant agencies (i.e. cultural and heritage advisors).
- The implementation of a Cultural Heritage Protection Program (CM05) will support the development of mitigation and response strategies for identified cultural heritage risks associated with the petroleum activity, reducing the likelihood and consequence of unplanned events with the potential to effect cultural values and sensitivities.
- Spill response activities will be carried out in accordance with a NOPSEMA approved OPEP (Appendix I), under the guidance of the National Plan (AMSA 2020) to ensure they are compliant with industry best practice and Australian legislation and requirements.
- There is a good understanding of potential impacts and risks from oil spill response activities, and the control measures required to manage these (see Appendix I for relevant Control Measures and Environmental Performance Standards).

7.8.9. Control Measures and Demonstration of ALARP

ConocoPhillips Australia demonstrates risks are reduced to as low as reasonably practicable (ALARP) when the cost and effort required to further reduce risk is grossly disproportionate to the risk benefit gained.

For the assessment of ALARP, **Decision Context B** has been applied:

- Impacts are relatively well understood, and uncertainty has been managed through risk assessment, Strategic NEBA and commitment to undertaking an Operational NEBA prior to the response
- Good practice controls measures are in place to prevent the occurrence of a LOWC event and MDO release, therefore, there is a remote likelihood that spill response activities will be required
- With control measures in place, the response activity is not anticipated to result in serious or irreversible environmental damage or long-term socio-economic or cultural impacts
- There are no conflicts with company values
- Feedback, objections and claims from relevant persons have been taken into consideration, and
- Additional control measures have been considered to ensure impacts are managed to ALARP and acceptable levels.

Table 7-46 documents the assessment of control measures and ALARP demonstration for spill response activities.

Table 7-46: Control measures for spill response activities and ALARP demonstration

Adopted Control Measures			
Control	**Source of good practice control measure**		
Adopted spill response control measures are detailed within the OPEP (see Appendix I).			
CM05: Cultural Heritage Protection Program	A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88).		
Additional Controls Assessed – ALARP Assessment			
Control	**Benefit Analysis**	**Cost Analysis**	**Control Adopted?**
Autonomous Underwater Vehicles (AUVs) for Surveillance, Modelling and Visualisation	This control measure is not expected to provide significant environmental benefit as mobilisation of in-field monitoring, or aerial surveillance can be implemented rapidly via existing contracts.	Costs associated with acquiring the equipment, maintenance and training personnel to use AUVs is considered grossly disproportionate to the benefit gained.	Reject
Infrared	Infrared may be used to provide aerial monitoring at night-time. However the benefit is minimal given trajectory modelling and infield monitoring during daylight hours will provide for operational awareness. In addition to this, satellite imagery may be used to provide additional operational awareness.	Side looking airborne radar, systems are required to be installed on specific aircraft or vessels. The costs of sourcing such vessels/aircraft is considered grossly disproportion to the benefit gained.	Reject
Develop tactical response plans	Identified areas for priority protection have been pre-populated in tactical response plans, effectively reducing response planning timeframes in the event of potential shoreline exposure.	Minimal cost and effort to develop, considered feasible and of benefit.	Adopt OPEP
Pre-position first strike response resources (Org ID:33, Environment Protection Authority (EPA) Tasmania Event, ID: 2574, FB ID:	First strike response equipment is available from Geelong (AMOSC). Positioning the equipment closer to predicted response areas may provide an environmental benefit where pre-spill predictions align with actual conditions. Along the Victorian coastline, visible shoreline contact is not predicted until day 2-3 depending on the spill source location, therefore there is adequate time to deploy equipment along the Victorian coastline from Geelong. The benefit increases	Evaluation of trade-offs indicates that pre-positioning resources along the Victorian coastline is unlikely to provide any meaningful benefit. Pre-positioning resources to King Island, Tasmania, where transport times may exceed the time to contact, is considered feasible and of benefit in the event that exploration drilling activities are scheduled to occur	Partial Adopt: OPEP

115; Org ID: 72, King Island Shire Council, Event ID: 1366, FB ID: 420)	where transport times exceed the predicted minimum time to contact. Post-spill operational monitoring would be required to confirm likely exposure locations, and reliance on pre-spill predictions to position equipment may be inaccurate.	within the operational area immediately adjacent to King Island.	
Pre-installing temporary accommodation for response personnel (Org ID: 72, King Island Shire Council, Event ID: 1366, FB ID: 420)	Pre-installing temporary accommodation at remote locations ensures response personnel can be accommodated, if required, and reduces the potential for displacement of tourists. Limited benefit along the Victorian coastline with increased options for accommodation and availability of response personnel from Geelong. The benefit increases where there are limited options for accommodation and transport arrangements are more complex. Post-spill operational monitoring would be required to confirm likely response locations, and reliance on pre-spill predictions to position accommodation may be inaccurate.	Evaluation of trade-offs indicates that pre-installing temporary accommodation along the Victorian coastline is unlikely to provide any meaningful benefit. The costs associated with mobilising, installing and demobilising temporary accommodation to King Island, Tasmania, for use by a limited number of personnel in the highly unlikely event of a spill during short-term exploration activities within the operational area adjacent to King Island, is considered grossly disproportionate to the benefit.	Reject

Receptor	Consequence	Likelihood	Risk Rating
Ecological Receptors	Moderate (3)	Remote	Medium (RR II)
Conservation Values and Sensitivities	Moderate (3)	Remote	Medium (RR II)
Socio-economic Receptors	Minor (2)	Remote	Low (RR I)
Cultural Environment	Minor (2)	Remote	Low (RR I)

ALARP Statement	The decision context has been assessed as Type B, with uncertainty managed through risk assessment, Strategic NEBA and commitment to undertaking an Operational NEBA prior to the response oil spill trajectory modelling. The residual risk ratings are lower order – Low (RR I) to higher order – Medium (RR II). The adopted control measures minimise the likelihood and consequence of impacts associated with spill response activities through effective response preparedness, and are considered effective and appropriate to the predicted environmental impacts. The adopted control measures have been developed in accordance with legislative requirements and good industry practice, using professional experience and considering the specific ecological, conservation, socio-economic and cultural values and sensitivities of the region. Additional control measures were considered as part of the assessment process and were adopted where they provided further environmental benefit or were practicable to implement. Therefore, the predicted risks to the environment from spill response activities associated with the Otway Exploration Drilling Program are reduced to ALARP.

7.8.10. Acceptability Assessment

Table 7-47 compares the predicted risk levels for spill response activities against the acceptable levels.

Table 7-47: Comparison of defined acceptable levels with risk levels for spill response activities

Defined Acceptable Levels		Risk Level	Is predicted impact below defined acceptable level?
Source	Level		
Principles of ESD	Activities that result in temporary / reversible, small scale, and/or low intensity environmental damage. Environmental risks have a worst-case ranking of less than Significant (RR II).	Planned activities are not expected to result in spill response activities. The residual risk ranking is **Medium (RR II)**.	Yes
Principles of ESD	Enough appropriate information to understand impact/risk of serious/ irreversible environmental damage. Application of the precautionary principle in the presence of scientific uncertainty.	There is high confidence in the prediction.	Yes

Defined Acceptable Levels		Risk Level	Is predicted impact below defined acceptable level?
Source	**Level**		
Principles of ESD	EPBC Program Requirements: The EP must not be inconsistent with EPBC Management Plans and Recovery Plans.	Impacts from spill response activities are not listed as a threat in any relevant Management or Recovery Plans.	Yes
Biological Ecological Economic Cultural	No death or injury to listed threatened and migratory species resulting from the spill response activities. Impacts to cultural heritage, social values, native fauna and vegetation from spill response activities are prevented.	There is a low to moderate consequence level because the behaviour of marine fauna cannot be controlled, and cultural values and sensitivities may not be easily identifiable. However, with the control measures adopted, the likelihood of a spill response activities causing impact is remote.	Yes
ConocoPhillips Australia Policies	All reasonably practicable control measures have been adopted to reduce environmental impacts and risks.	Adopted control measures as listed above have been assessed to ensure that environmental risks will be of an acceptable level throughout the Otway Exploration Drilling Program.	Yes
ConocoPhillips Australia Policies	Environmental impacts and risks are consistent with environmental policies and processes such that residual environmental risks will be below Significant (RR III).	**Likelihood**: Remote **Consequence**: Moderate based on the highest consequence ranking in Section 7.8.8 **Residual Risk**: **Medium (RR II)**	Yes
Relevant Persons Consultation	Measures have been adopted because of the consultations to address reasonable objections and claims of relevant persons. The views of relevant persons have been considered in the preparation of the EP. The views of public will be considered in the preparation of the EP following public comment.	Claims and objections relevant to IMS have been considered (with more detail provided in Section 3). These include: • Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, Reg16b ID 54, 57; Org ID: 92, Event ID: 3818, FB ID: 402-413; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 346, 347; Org ID: 602, Event ID: 3269, FB ID: 343; Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 1657, FB ID: 88 – Cultural heritage • Org ID:33, Environment Protection Authority (EPA) Tasmania Event, ID: 2574, FB ID: 115; Org ID: 72, King Island Shire Council, Event ID: 1366, FB ID: 420 – Pre-positioning response resources	Yes
International Standards, Industry Best Practice	Relevant international, national, and industry standards have been considered and where relevant applied in the EP.	Yes, see Appendix A.	Yes
Acceptability Statement	Decision-type B risks are considered acceptable if the requirements in Table 7-49 can be demonstrated and if the level of residual risk has a rating less than Significant (RR III)). Following completion of the risk assessment process, the risks associated with spill response activities are considered acceptable because: • Good practice controls are clearly defined and have been implemented.		

Defined Acceptable Levels		Risk Level	Is predicted impact below defined acceptable level?
Source	Level		
	• Adequate procedures and guidelines are in place to minimise impacts from spill response activities. • The activities will be managed in accordance with relevant ConocoPhillips Australia, Commonwealth, international, and Industry standards, guidelines and requirements. • In the unlikely event of a spill, ConocoPhillips Australia has an OPEP in place to facilitate a rapid and effective response, and an OSMP to support the response and monitor impact and recovery over time. The control measures that will be implemented in the event of a spill from the Otway Exploration Drilling Program are considered effective and appropriate to manage the risks associated with spill response activities. Based on the above evaluation, the risks associated with spill response activities meet the defined acceptable levels.		

7.8.11. Environmental Performance

Environmental Performance Outcomes (EPO), Standards (EPS) and measurement criteria for response preparedness and implementation of response activities are detailed in the OPEP (Appendix I).

8. Cumulative Impact Assessment

8.1. Introduction

NOPSEMA defines cumulative environmental impacts in the context of offshore petroleum activities, as successive, additive, or synergistic impacts of collectively significant activities or projects with material impacts on the environment that have the potential to accumulate over temporal and spatial scales (NOPSEMA Environment Plan Decision Making Guideline, N-04750-GL1721 A524696, Dec 2022).

The effects of past projects and activities, and currently operating projects, are captured when describing the existing condition of, and any pressure or threats affecting the environment (see Section 4 Description of the Environment). This baseline condition and understanding of the capacity of the receiving environment and receptors to accommodate changes, in light of existing pressures and threats, informs the environmental impact assessments conducted in Section 6 of this EP.

The focus of Cumulative Impact Assessment (CIA) is to further build on these assessments by considering the impacts of the proposed activity on key receptors (or key matters), wholistically, and also in conjunction with the impacts from other reasonably foreseeable future projects (Org ID: 7, Director of National Parks (DNP), Event ID: 2470, FB ID: 244; Org ID: 593, Event ID: 3134, FB ID: 227).

The types of activities and projects typically considered in CIA are large in scale and are of relevance in terms of potentially contributing to or compounding material impacts in the relevant project area.

[This section has been updated in response to Matter: E10].

8.2. Methodology

ConocoPhillips Sustainable Development Implementation Guidelines, which require evaluation of cumulative impacts, along with guidance from the United Kingdom (UK) National Infrastructure Planning Advice Note Seventeen: Cumulative effect assessment relevant to nationally significant infrastructure programs (UK Gov 2019) and the New South Wales (NSW) Cumulative Impact Assessment Guidelines for State Significant Projects (NSW 2022), form the basis of this assessment.

Both the UK and NSW guidelines are intended to apply to large-scale national and state significant projects, respectively, with greater potential for cumulative impacts into the long-term. Consequently, the assessment process applied here has been adapted to the short-term nature and small scale, localised activities associated with the proposed Otway Exploration Drilling Program.

8.2.1. Scoping the Assessment

Scoping considerations identified for CIA include:

- Successive, additive, or synergistic material impacts
- Affecting key environmental matters within the relevant spatial extent
- With potential to accumulate over the relevant temporal extent.

Material impacts are impacts of the project and other reasonably foreseeable future projects and activities that may not align with the defined acceptable levels, for example, threats of wide-scale, serious or irreversible damage due to cumulative impacts.

Successive impacts are those that occur one after the other.

Additive impacts are those where the combined impact is the sum of the separate impacts.

Synergistic impacts are those where the combined impact is greater than the sum of the separate impacts.

Key environmental matters are features of the environment (ecological, socio-economic, and cultural values and sensitivities) that are valued because of their rarity or importance, including the critical role they play in supporting systems which are essential for the environment, people and / or the economy (NSW 2022), for example, commercial fisheries and threatened species undertaking biologically important behaviours.

The relevant **spatial extent** depends on the key matter. For example, for ecological impacts the spatial extent may be based on the range and distribution of a listed threatened species when undertaking biologically important behaviour. NSW (2022) recommends that while the study area chosen for each matter must be broad enough to capture all relevant cumulative impacts, it should not be unnecessarily large or include areas where the cumulative impacts are likely to be negligible relative to the baseline condition of the relevant matter.

Temporal extent is dependent on the key matter and the scale and nature of potential impacts on the matter (NSW 2022). For example, for commercial fishers the temporal extent may be based on a part of a season or several seasons depending on how long the impact may occur. For this CIA the temporal extent selected has been aligned to reasonably foreseeable timeframes associated with the project and other reasonably foreseeable projects and activities within the Otway Basin.

8.2.2. Identifying Reasonably Foreseeable Future Projects and Activities

CIA considers projects and activities that are reasonably foreseeable within the spatial and temporal extent of the assessment. This defines the boundaries of the assessment by including projects and activities that have a realistic likelihood of occurring and could contribute to cumulative impacts. It involves considering current industry trends, known development plans, regulatory frameworks, and scientific projections to determine which activities are within the CIA scope.

To identify reasonably foreseeable future projects and activities a search was conducted of the NOPSEMA and DEECA (Vic) Environment Plan website to identify any relevant projects and activities. In addition, titleholders within the Otway Basin have been meeting regularly to discuss environmental management in the region, including processes for improved CIA, focusing on reasonably foreseeable activities. This has provided a more accurate representation of projects and activities and the potential for cumulative impacts, ensuring that relevant impacts are appropriately assessed and managed.

Reasonably foreseeable future projects and activities identified to date, within the term of the EP, are listed in Table 8-1. Projects and activities that are not reasonably foreseeable or speculative have been excluded from the assessment scope to maintain practicality and relevance in decision-making processes.

Information on projects and activities is typically accessible once consultation commences and relevant technical supporting information is submitted for public comment or assessment. Information relevant to this

CIA has been discussed at the ongoing Otway Basin Petroleum Titleholder meetings. Where project/activity-specific data is not yet available, data from similar projects has been used as a proxy prior to technical information being made available. Given the similarity of impacts, there is a high level of certainty in the prediction of cumulative impacts in most cases.

Assumptions around specific timings for projects or activities have been made as there is some level of uncertainty in schedule and timing of approvals to support activities. Consequently, a conservative approach has been adopted whereby credible worst-case scenarios (e.g. concurrent activities with overlapping EMBAs) are assessed.

Table 8-1: Reasonably foreseeable future projects and activities in the offshore Otway Basin

Titleholder	Activity Type	Status	Window (Activity)	Temporal Overlap	Spatial Overlap
ConocoPhillips Australia SH1 Pty Ltd and SH2 Pty Ltd	Drilling	Proposed	2024-2028 (Typically 30-40 days per well, max 6 wells)	Very high likelihood of consecutive drilling/P&A activities. Possible likelihood of concurrent seismic survey and drilling/P&A activities. Extremely remote likelihood of concurrent seismic operations. Extremely remote likelihood of concurrent drilling/P&A activities.	Extremely remote likelihood of direct spatial overlap of seismic survey areas. Extremely remote likelihood of direct spatial overlap of drilling/P&A areas. Possible overlap of 1 seismic survey area and drilling activities over VIC/P79. Possible likelihood of overlap of light EMBAs associated with concurrent seismic survey and drilling/P&A at a single location. Extremely remote likelihood of overlap of sound EMBAs associated with concurrent seismic survey and drilling/P&A at a single location.
Cooper Energy (CH) Pty Ltd	Drilling and tie-in	Proposed	2024-2026		
Woodside Energy Pty Ltd	Decommissioning and P&A	Proposed	2024-2025 (< 2 months)		
Beach Energy (Operations) Limited	Drilling and tie-in	Proposed	2024-2027		
TGS -NOPEC Geophysical Company Pty Ltd	Seismic Survey	Proposed	2023-2027 (200 days per year, 400 days max)		
CGG – Regia	Seismic Survey	Proposed	2023-2028 (60 days)		

8.2.2.1. Identified Aspects and Extents

During the environmental impact assessment process (described in Sections 5 and 6 of the EP), components of the environment and aspects of the Otway Exploration Drilling Program and were identified where there was the potential for successive, additive, or synergistic impacts to reasonably accumulate over temporal and spatial scales, when considered in the context of the whole program and reasonably foreseeable future projects or activities in the Otway Basin.

The CIA Scoping Tool (Appendix A – CIA Scoping Tool) details the assessment undertaken of the components of the environment and aspects of the Otway Exploration Drilling Program to identify where a potential cumulative cause-effect pathway within the program and in conjunction with other reasonably foreseeable future projects (identified in Table 8-1) may occur and, if it may occur, was likely to have a material impact. Where a potential cumulative cause-effect pathway and material impact was identified further assessment was undertaken as detailed in Section 8.2.3 Assessing Nature and Scale.

The components of the environment and aspects identified during the CIA scoping process requiring further assessment are, include:

- Light – impacts on light-sensitive bird species.
- Underwater sound – impacts on noise-sensitive whale species.
- Birds – nocturnal behaviours of species such as the common diving petrel which has a breeding BIA on Lady Julia Percy Island, and the orange-bellied parrot (Org ID: 524, Wilderness Society, Event ID: 4359, FB ID: 470) which may overfly the light EMBAs on migration.
- Marine Mammals – biologically important behaviours of species such as the blue whale and southern right whale within relevant BIAs that overlap underwater sound EMBAs.
- Commercial Fisheries – displacement from within relevant fishery management areas (Org ID: 50, Tasmanian Seafood Industry Council (TSIC), Event ID: 1821, FB ID: 149, 150; Org ID: 433, Event ID: 2663, FB ID: 134; Org ID: 36, Victorian Fishing Authority (VFA), Event ID: 2522, FB ID: 87).

It was also identified that the conservation values and sensitivities of the Zeehan Marine Park and the First Nations cultural heritage values associated with the above environmental components could be affected by cumulative impacts.

8.2.3. Assessing Nature and Scale

For those components of the environment and aspects where a potential cumulative cause-effect pathway and material impact was identified, a CIA process was applied in general alignment with the activity-specific methodology described in Section 5 (Appendix A – CIA Tool).

An overview of the CIA process applied to each aspect and component of the environment is provided below:

- Identification of:
  - Aspect sensitive key environmental matters within the component of the environment that may be impacted.
  - Species/receptor conservation values or values relevant to CIA e.g. EPBC Listed Threatened Species, MNES, commercial or cultural significance
  - Legislative or other requirements relevant to receptors and the aspect
  - Relevant threatening processes.
  - Relevant spatial extent such as BIAs.
  - Any biologically important features such as behaviours or critical life-cycle stages, timings.
  - Relevant actions from legislative or other requirements.
- Defining the acceptable level.
- Detailing the baseline existing environment including pressures and condition.
- Identification of other reasonably foreseeable future projects where the aspect overlaps the identified relevant spatial extent.
- Assessment of potential for cumulative impacts, and where indicated:
  - Description of potential cumulative impact.
  - Details of ConocoPhillips Australia's existing control measures.
  - Assessment against baseline (existing environment condition, threats and pressures).
  - Comparison to acceptable level(s), and where required (reiterative process):
    - Identification of additional control measures (see Table 8-2) and demonstration that cumulative impacts are as low as reasonably practicable (ALARP).
- Detailing any additional actions.

8.2.3.1. Identification of Additional Control Measures

Additional control measures may be required as a result of CIA to support the demonstration of ALARP and meet acceptable levels for cumulative impacts. Additional control measures may include a review and strengthening of existing measures, investigating the feasibility of additional mitigation measures or adaptive management processes, refining the activity description to reduce impact, and working with the proponents of other relevant reasonably foreseeable future projects to develop holistic mitigation strategies that consistently improve outcomes.

8.3. Outcome of Cumulative Impact Assessment

The CIA Tool, as applied to the identified key matters, is presented in Table 8-2. Information used in the CIA is sourced from the Existing Environment (Section 4) and the relevant impact assessment section for each aspect, in Section 6.

Table 8-2: Cumulative impact assessment summary of outcomes

CIA Process	Interference via Displacement	Light		Underwater Sound	
Key Matter	**Commercial fishers**	**Albatross, Petrels and Shearwaters**	**Orange-bellied parrot**	**Blue whale (BW)**	**Southern right whale (SRW)**
Conservation (or other) value	Socio-economic value to local communities and national economy. The ConocoPhillips Australia operational areas overlap ≥ moderate fishing intensity data for: • SESSF – Shark Gillnet Sector – Sustainable stock with exception of School shark (Conservation Dependent – fishing pressure). • Southern Squid Jig Fishery and Commonwealth Trawl Sector squid catch – Sustainable stock • Victorian SRL Fishery – Sustainable stock • Victorian GC Fishery – Sustainable stock	Antipodean, southern royal, wandering, northern royal, Sooty, Buller's, shy, grey-headed, Campbell, black-browed, Salvin's, Indian yellow-nosed, and white-capped albatrosses; southern and northern giant, common diving and white-faced storm-petrels; short-tailed and wedge-tailed shearwaters. Endangered, Vulnerable, not listed, some with foraging BIAs, common diving petrel (nocturnal), short-tailed shearwater and wedge-tailed shearwater with breeding BIAs within EMBAs. Short-tailed shearwater also identified cultural value.	Listed as Critically Endangered and Marine under the EPBC Act and noted as a species of cultural significance.	Listed as Endangered under the EPBC Act.	Listed as Endangered under the EPBC Act and noted as a species of cultural significance in the draft National Recovery Plan for the Southern Right Whale (CoA 2022).
Management Plans	Southern and Eastern Scalefish and Shark Fishery (SESSF) Species Summaries (AFMA 2023)	National Recovery Plan for Albatrosses and Petrels (DCCEEW 2022e). Wildlife Conservation Plan for Seabirds (DCCEEW 2020). National Light Pollution Guidelines for Wildlife (CoA 2023).	National Recovery Plan for the Orange-bellied Parrot (DoE 2016)	Conservation Management Plan for the Blue Whale (DoE 2015) Guidance on key terms within the Blue Whale Conservation Management Plan (DAWE 2021a)	Conservation Management Plan for Southern Right Whale (DSEWPaC 2012b) Draft National Recovery Plan for the Southern Right Whale (CoA 2022)
Threatening Processes	Nil, other than fishing pressure for school shark	Light emissions are identified as a threat in the National Recovery Plan for Albatrosses and Petrels but marine infrastructure interactions, including those associated with artificial light, are classified as having no risk category priority and affecting 'Nil' species in Australian jurisdiction. The National Recovery Plan for Albatrosses and Petrels also states that light associated with coastal developments at or adjacent to breeding sites represents a moderate threat to short-tailed shearwater. Light pollution, including from gas flaring, is listed as a threat to seabirds in the Wildlife Conservation Plan for Seabirds, with potential for consequences affecting individuals but not whole populations.	Illuminated boats and structures within the migration route as a barrier to migration (weak evidence for impact, moderate risk rating) when overflying the light EMBAs.	Conservation Management Plan for the Blue Whale identifies anthropogenic noise interference as a threat.	Conservation Management Plan for the Southern Right Whale and draft National Recovery Plan for the Southern Right Whale identify noise interference as a threat.
Relevant Spatial and Temporal Extent	Fishery Management Areas (for the above listed fisheries) focussing on fisheries with evidence of ≥ moderate activity in ConocoPhillips Australia's operational areas, but informed during preparation of the Commercial Marine Operators Adjustment Protocol (CM04).	Foraging BIAs for Antipodean, black-browed, Buller's, Campbell, Indian yellow-nosed, shy and wandering albatross, white-faced storm petrel, short-tailed shearwater and common diving-petrel within operational light and flaring EMBAs. Only common diving-petrel identified as foraging at night. Breeding BIAs for short-tailed shearwater and wedge-tailed shearwater within flaring EMBA. Breeding BIA for common diving petrel within operational light and flaring EMBAs.	Probable Migration Route September-November (Southward); February-mid-March (northwards). ConocoPhillips Australia's light EMBAs do not overlap with the Migration Route.	Underwater sound EMBAs overlap Foraging and Annual High use Foraging BIAs. Blue whales are typically present within the BIAs between November to June, peaking in February and March	Overlap of underwater sound EMBAs with Migration BIA. Southern right whales are typically within the migration BIA approximately April to October.
Recovery (or other) Action	There are no relevant recovery plans or actions.	National Recovery Plan for Albatrosses and Petrels: no relevant actions.	Assess the risk of barriers, being illuminated structures or boats, on the probable migration route. Manage threat if the risk rating warrants action.	Conservation Management Plan for the Blue Whale states that anthropogenic noise in BIAs must be managed so that blue whales can continue to utilise the area without injury and [are] not displaced from a	Draft National Recovery Plan for the Southern Right Whale: Actions within and adjacent to SRW BIAs and habitat critical to the survival of SRWs should demonstrate that is does not prevent any SRW from

CIA Process	Interference via Displacement	Light		Underwater Sound	
Key Matter	**Commercial fishers**	**Albatross, Petrels and Shearwaters**	**Orange-bellied parrot**	**Blue whale (BW)**	**Southern right whale (SRW)**
		Wildlife Conservation Plan for Seabirds: Mitigate against impacts of light pollution around breeding colonies. National Light Pollution Guidelines for Wildlife recommend: 1. Always using Best Practice Lighting Design to reduce light pollution and minimise the effect on wildlife. 2. Undertaking an Environmental Impact Assessment for effects of artificial light on listed species for which artificial light has been demonstrated to affect behaviour, survivorship or reproduction.	National Light Pollution Guidelines for Wildlife recommend: 1. Always using Best Practice Lighting Design to reduce light pollution and minimise the effect on wildlife. 2. Undertaking an Environmental Impact Assessment for effects of artificial light on listed species for which artificial light has been demonstrated to affect behaviour, survivorship or reproduction.	foraging area. DAWE (2021a) details that underwater anthropogenic noise should not: • Stop or prevent any blue whale from foraging • Cause any blue whale to move on when foraging, or • Stop or prevent any blue whale from entering a foraging area	utilising the area or cause injury (PTS, TTS) and/or disturbance. NOTE: Legal definition of 'Should' means expected course of action or policy to be followed unless inappropriate for a particular circumstance. NOTE: No habitat critical to the survival of SRWs have been identified.
Baseline Environment Condition	Fisheries overlap with existing shipping channel and area with existing oil and gas activity. Fisheries with ≥ moderate activity in the area historically have sustainable stock status; however School sharks are listed as Conservation Dependent (fishing pressure) in the SESSF – Shark Gillnet Sector.	Existing lighting in the area includes fishing vessels, shipping traffic, existing offshore oil and gas platform and coastal developments. The shipping channel for vessels coming from Melbourne to Tasmania is one of the busiest shipping routes in offshore Australia.	The orange-bellied parrot probable migration route is within the shipping channel for vessels coming from Melbourne to Tasmania - one of the busiest shipping routes in offshore Australia.	The BIAs overlap existing shipping channel, area of high commercial fishing effort, and existing oil and gas activity.	The BIAs overlap existing shipping channel, area of high commercial fishing effort, and existing oil and gas activity.
Acceptable Level	Commercial fishers are not economically disadvantaged as a result of oil and gas activities in the offshore Otway Basin.	Cumulative light does not impact breeding colonies of short-tailed shearwaters, wedge-tailed shearwaters or the common diving petrel, or populations of other species that forage in the area.	Light from cumulative sources does not affect migration of the orange-bellied parrot at a population level.	The activity will be carried out in a manner that will not be inconsistent with the Conservation Management Plan for the Blue Whale such that blue whales can continue to utilise the area without injury and [are] not displaced from a foraging area.	The activity will be carried out in a manner that will not be inconsistent with the draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a) such that actions within and adjacent to SRW BIAs should demonstrate that it does not prevent any SRW from utilising the area or cause injury (TTS and PTS) and/or disturbance.
Other Reasonably Foreseeable Projects/ Activities Relevant to Key Matter	Cumulative impacts could occur from the occurrence of two successive seismic surveys, one seismic survey occurring concurrently with drilling/P&A activities and/or consecutive drilling/P&A activities with operational exclusions zones overlapping fishery management areas, in addition to existing pressures.	Foraging BIAs: Potential for overlap between single seismic survey and single drilling operation, and sequential drilling/P&A activities. Breeding BIAs for short-tailed shearwaters: no overlap predicted from multiple projects, only for drilling in T/49P which, from the activity impact assessment, is not predicted to result in behavioural impacts or injury/mortality to the species. No cause-effect pathway for cumulative impact identified. Breeding BIA for wedge-tailed shearwater: overlap only with flaring EMBA from the Otway Exploration Drilling Program and light EMBAs from other consecutive drilling /P&A activities, not from concurrent activities. Breeding BIA for Common diving-petrel: This species is particularly susceptible to coastal light impacts when returning to or leaving the nesting colony which may result in a disruption to adult nest attendance (CoA 2023). Regia and ConocoPhillips Australia's drilling activities in the north of VIC/P79 cannot occur at the same time, with limited potential for impacts from consecutive operations which are scheduled to be >18 months apart in this area. No cause-effect pathway for cumulative impact identified.	Only overlap with other Otway projects is with light EMBAs, not illuminated structures or vessels. Spatial: Potential overlap between Regia seismic and one drilling activity with light EMBA overlapping the probable migration route - for one season (while seismic is occurring). Temporal: Consecutive drilling operations over an extended period of time may have light EMBAs that overlap the probable migration route. .	With the current uncertainty on the timing of some other projects and the distance of underwater sound EMBAs, there is the potential for cumulative impact if the following occur within the migration BIA during the biologically relevant periods (nominally November to May): • Overlap between one seismic survey and one drilling activity for one season. • Consecutive drilling/P&A activities over a number of seasons. • Consecutive seismic surveys in one season or over a number of seasons.	Cumulative impacts from ConocoPhillips Australia activities to the SRW Breeding BIA are not predicted as the ConocoPhillips Australia sound EMBAs do not overlap with this area. With the current uncertainty on the timing of some other projects and the distance of underwater sound EMBAs, there is the potential for cumulative impact if the following occur within the migration BIA during the biologically relevant periods (nominally April - October): • Overlap between one seismic survey and one drilling activity for one season. • Consecutive drilling/P&A activities over a number of seasons.
Description of Cumulative Impact (including spatial/temporal extent) and	No material cumulative cause-effect pathway identified from combined aspects of the proposed ConocoPhillips Australia Otway Exploration Drilling Program.	No material cumulative cause-effect pathway identified from combined aspects of the proposed ConocoPhillips Australia Otway Exploration Drilling Program. Potential for cumulative impacts by the proposed ConocoPhillips Australia Otway Exploration Drilling	No material cumulative cause-effect pathway identified from combined aspects of the proposed ConocoPhillips Australia Otway Exploration Drilling Program. For reasonably foreseeable seismic surveys, cumulative impacts from light emissions on the probable migration	No material cumulative cause-effect pathway identified from combined aspects of the proposed ConocoPhillips Australia Otway Exploration Drilling Program. In association with other activities, without appropriate detection and actions in place there is the	No material cumulative cause-effect pathway identified from combined aspects of the proposed ConocoPhillips Australia Otway Exploration Drilling Program. In association with other activities, without appropriate detection and actions in place there is the potential that SRWs could be exposed to underwater sound from two

CIA Process	Interference via Displacement	Light		Underwater Sound	
Key Matter	**Commercial fishers**	**Albatross, Petrels and Shearwaters**	**Orange-bellied parrot**	**Blue whale (BW)**	**Southern right whale (SRW)**
consequence rating. [Row updated in response to Matter: E10].	Commercial fishers with moderate to high fishing activity may potentially be displaced within relevant Fishery Management Areas in the offshore Otway Basin by the proposed ConocoPhillips Australia Otway Exploration Drilling Program and by other reasonably foreseeable seismic surveys and drilling/P&A activities, potentially requiring multiple applications for compensation to be lodged with a range of titleholders and a reduction in the area available to be fished.	Program and by other reasonably foreseeable seismic surveys and drilling/P&A activities associated with: Foraging BIAs: limited spatial extent of effect compared to area available for foraging. Most species forage during daylight. The National Recovery Plan for Albatrosses and Petrels states that marine infrastructure interactions, including those associated with artificial light, are classified as having no risk category priority and affecting 'Nil' species in Australian jurisdiction. Breeding BIA for wedge-tailed shearwater - only overlapped by flaring EMBA from ConocoPhillips Australia which is limited to 120 hours per well. This species is not listed as threatened and periodic changes in ambient light within the EMBAs is unlikely to cause behavioural changes or result in injury/mortality to this species.	route would be of short duration only when acquiring in the eastern side of the area at night, concurrently with a single drilling operation. Seismic program is limited to a maximum of 90 days, with 60 days of acquisition. Temporal: Light EMBA from a single drilling rig overlapping varying spatial extents of the probable migration route over a period of years. No evidence of orange-bellied parrot presence offshore recorded during Beach Energy Otway 18 month drilling campaign in region or Beach Otway Operations over the last 10 years. Numbers continue to increase despite ongoing petroleum activities within the Otway Basin. The cumulative impact of light emissions from Otway petroleum activities including other foreseeable activities would be very low in comparison to the light emissions associated with existing shipping and fishing operations within the migration route. In addition, the majority of these vessels are not required to operate in accordance with a Light Management Plan.	potential that blue whales could be exposed to underwater sound from two sources (seismic and drilling) within the foraging BIA that could result in them expending more energy to move away from the sound source to forage or restrict the area of foraging. This could also occur for consecutive years whilst drilling/P&A activities are undertaken within the Otway Basin. Cumulative impacts resulting in an increase in the likelihood of PTS and TTS for foraging blue whales is not predicted due to the small distances to the PTS and TTS noise criteria for drilling activities.	sources (seismic and drilling) within the migration BIA that could result in them expending more energy to move away from the sound source when migrating to and from coastal breeding areas. This could also occur for consecutive years whilst drilling/P&A activities are undertaken within the Otway Basin. Cumulative impacts resulting in an increase in the likelihood of PTS and TTS for a migrating SRW is not predicted due to the small distances to the PTS and TTS noise criteria for drilling activities.
Predictability/ Certainty of Assessment	Given the intensity of fishing in the area, and the overlap of fishery management areas with the proposed activities of multiple titleholders, the assessment of cumulative impacts is made with a high level of predictability and certainty.	The overlap of light EMBAs with foraging and breeding BIAs is predicted to be limited to only 2 concurrent activities at a time (seismic survey and drilling/P&A at one location – lady Julia Percy Island) and then only consecutively from individual drilling/P&A activities. The assessment of cumulative impacts is made with a high level of predictability and certainty.	There is no published information available on the sensitivity of the orange-bellied parrot to light, and only anecdotal evidence exists regarding the impact of barriers to migration (DELWP 2016). This introduces some uncertainty into the assessment of cumulative impacts.	There is a high level of predictability and certainty in the limited potential for cumulative impacts, given the requirements in place for each activity to prevent impacts.	There is a high level of predictability and certainty in the limited potential for cumulative impacts, given the requirements in place for each activity to prevent impacts.
Existing Control Measures	A single MODU has been contracted to conduct drilling/P&A activities in the region, mitigating the potential for concurrent impacts from these activities. Titleholders overlapping fishery management areas with recorded fishing intensity typically have consultation and notification processes, and a compensation protocol in place to ensure fishers are no worse off as a result of their proposed activity. CM04: Commercial Marine Operators Adjustment Protocol CM03: Marine and Coastal Users Consultation and Communication Plan	A single MODU has been contracted to conduct drilling/P&A activities in the region, mitigating the potential for concurrent impacts from these activities. Titleholders with light EMBAs overlapping bird foraging or breeding BIAs are required to have a light management plan that meets the requirements of the National Light Pollution Guidelines. CM01: Marine Assurance Process CM02: Vessel and MODU Operating Procedures CM07: Light Management Plan CM10: Well Testing Program CM11: Procurement Vetting Process	A single MODU has been contracted to conduct drilling/P&A activities in the region, mitigating the potential for concurrent impacts from these activities. Titleholders with light EMBAs overlapping or adjacent to orange-bellied parrot migration routes are required to have a light management plan that meets the requirements of the National Light Pollution Guidelines. CM01: Marine Assurance Process CM02: Vessel and MODU Operating Procedures CM07: Light Management Plan CM10: Well Testing Program CM11: Procurement Vetting Process	A single MODU has been contracted to conduct drilling/P&A activities in the region, mitigating the potential for concurrent impacts from these activities. Titleholders are required to undertake their activity in a manner that is not inconsistent with the in force Conservation Management Plan for the Blue Whale. CM01: Marine Assurance Process CM02: Vessel and MODU Operating Procedures CM08: Fauna Management Plan CM10: Well Testing Process CM11: Procurement Vetting Process	A single MODU has been contracted to conduct drilling/P&A activities in the region, mitigating the potential for concurrent impacts from these activities. Titleholders are required to undertake their activity in a manner that is not inconsistent with the in force Conservation Management Plan for Southern Right Whale. CM01: Marine Assurance Process CM02: Vessel and MODU Operating Procedures CM08: Fauna Management Plan CM10: Well Testing Process CM11: Procurement Vetting Process
Additional Control Measures / Environmental Performance Standards	**CM04: Commercial Marine Operators Adjustment Protocol** EPS 4.2 ConocoPhillips Australia will undertake to continue to work with other titleholders, fishing associations and fishers, to design an application process for compensation that minimises the potential for cumulative impacts associated with commercial fishers having to make multiple applications to multiple titleholders.	**CM02: Vessel and MODU Operating Procedures:** EPS2.2 The MODU and vessels will abide by activity exclusion zones in place for other activities in the offshore Otway Basin, to minimise the potential for cumulative impacts. EPS2.2 The MODU will conduct drilling activities at one location at a time, to minimise the potential for cumulative impacts. **CM07: Light Management Plan:** EPS7.7 ConocoPhillips Australia will work with other titleholders with the aim of minimising the potential for	**CM07: Light Management Plan:** EPS7.7 ConocoPhillips Australia will work with other titleholders with the aim of minimising the potential for cumulative impacts associated with light emissions, should activity timings overlap biologically important periods for light sensitive species. EPS7.8 Observations, incidents and opportunities for improvement regarding light management and bird interactions will be reported to other petroleum titleholders in the Otway Basin.	**CM08: Fauna Management Plan** EPS8.3 ConocoPhillips Australia will work with other the Otway Basin Petroleum Titleholders with the aim of minimising the potential for cumulative impacts associated with underwater sound, should activity timings overlap biologically important periods for blue whales. EPS 8.4 Observation, incidents, and opportunities for improvement will be reported to other petroleum titleholders in the Otway Basin regarding underwater sound management and whale interactions.	**CM08: Fauna Management Plan** EPS8.3 ConocoPhillips Australia will work with other the Otway Basin Petroleum Titleholders with the aim of minimising the potential for cumulative impacts associated with underwater sound, should activity timings overlap biologically important periods for southern right whales. EPS8.4 Observation, incidents, and opportunities for improvement will be reported to other petroleum titleholders in the Otway Basin regarding underwater sound management and whale interactions.

CIA Process	Interference via Displacement	Light		Underwater Sound	
Key Matter	**Commercial fishers**	**Albatross, Petrels and Shearwaters**	**Orange-bellied parrot**	**Blue whale (BW)**	**Southern right whale (SRW)**
		cumulative impacts associated with light emissions, should activity timings overlap biologically important periods for light sensitive species. EPS7.8 Report observation, incidents and opportunities for improvement regarding light management and bird interactions to other Otway Titleholders.			
Residual Cumulative Consequence	**Minor (2)**	**Negligible (1)**	**Negligible (1)**	**Minor (2)**	**Minor (2)**
ALARP Achieved	Yes - The residual consequence is lower order – Minor (2). Additional control measures were considered and adopted to minimise the consequence of impacts and are considered effective and appropriate to the predicted cumulative environmental impact.	Yes - The residual consequence is lower order – Negligible (1). Additional control measures were considered and adopted to minimise the consequence of impacts and are considered effective and appropriate to the predicted cumulative environmental impact.	Yes - The residual consequence is lower order – Negligible (1). Additional control measures were considered and adopted to minimise the consequence of impacts and are considered effective and appropriate to the predicted cumulative environmental impact.	Yes - The residual consequence is lower order – Minor (2). Additional control measures were considered and adopted to minimise the consequence of impacts and are considered effective and appropriate to the predicted cumulative environmental impact.	Yes - The residual consequence is lower order – Minor (2). Additional control measures were considered and adopted to minimise the consequence of impacts and are considered effective and appropriate to the predicted cumulative environmental impact.
Acceptable Level Achieved	Yes – Following completion of the CIA process, the residual lower order – Minor (2) consequence is considered acceptable because: •Good practice controls are defined and will be implemented. •The activities will be managed in accordance with relevant company, Commonwealth, international, and Industry standards, guidelines and requirements.	Yes – Following completion of the CIA process, the residual lower order – Negligible (1) consequence is considered acceptable because: • Limited spatial extent of effect compared to area available for foraging. Most species forage during daylight. The National Recovery Plan for Albatrosses and Petrels states that marine infrastructure interactions, including those associated with artificial light, are classified as having no risk category priority and affecting 'Nil' species in Australian jurisdiction. • Breeding BIA for wedge-tailed shearwater only overlapped by flaring EMBA from ConocoPhillips Australia which is limited to 120 hours per well. This species is not listed as threatened and periodic changes in ambient light within the EMBAs is unlikely to cause behavioural changes or result in injury/mortality to this species. • Good practice controls are defined and will be implemented. • Adequate procedures and guidelines are in place to minimise impacts. • The activities will be managed in accordance with relevant company, Commonwealth, international, and Industry standards, guidelines and requirements.	Yes – Following completion of the CIA process, the residual lower order – Negligible (1) consequence is considered acceptable because: • The impact of light emissions from a seismic vessel overlapping the light emission from a drilling rig are predicted to result in increases in ambient light that are short-term, fully recoverable and do not represent illuminated structures or boats within the migration route. • Light from drilling activities will only occur from a single location, with limited overlap with the probable migration route and do not represent illuminated structures or boats within the migration route. • Good practice controls are defined and will be implemented. • Adequate procedures and guidelines are in place to minimise impacts. The activities will be managed in accordance with relevant company, Commonwealth, international, and Industry standards, guidelines and requirements.	Yes – Following completion of the CIA process, the residual lower order – Negligible (1) consequence is considered acceptable because: • Titleholders are required to undertake their activity in a manner that is not inconsistent with the in force Conservation Management Plan for the Blue Whale. • Good practice controls are defined and will be implemented. • Adequate procedures and guidelines are in place to minimise impacts. • The activities will be managed in accordance with relevant company, Commonwealth, international, and Industry standards, guidelines and requirements.	Yes – Following completion of the CIA process, the residual lower order – Negligible (1) consequence is considered acceptable because: • Titleholders undertaking petroleum activities in the Otway Basin are required to undertake their activity in a manner that is not inconsistent with the in force Conservation Management Plan for Southern Right Whale. • Good practice controls are defined and will be implemented. • Adequate procedures and guidelines are in place to minimise impacts. • The activities will be managed in accordance with relevant company, Commonwealth, international, and Industry standards, guidelines and requirements.
Conservation Values and Sensitivities	Based on the outcome of the CIA, it is considered that cumulative impacts associated with the Otway Exploration Drilling Program and other reasonably foreseeable future projects and activities will not affect the representativeness of the South-east Commonwealth Marine Reserves Network, the conservation values of the Zeehan Marine Park associated with seabirds, the white shark and marine mammals, or sea-floor features (Org ID: 7, Director of National Parks (DNP), Event ID: 2470, FB ID: 246).				
First Nations Cultural Heritage	First Nations cultural heritage values, such as Sea Country and those associated with the environmental components assessed above, will be protected through the implementation of a Cultural Heritage Protection Program (CHPP) established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas. ConocoPhillips Australia has committed to ensuring the CHPP is open to investment from other parties to further the growth and scope of the program to address cumulative impacts, if it continues to be effective.				
Conclusion	The potential for cumulative impacts is considered low, with lower-order consequences (negligible to minor). The contracting of a single MODU to conduct exploration, production, and decommissioning activities in the region, has eliminated the potential for concurrent cumulative impacts associated with multiple MODU and support vessel operations. In addition, the longer-term operation of a single MODU supports the consistent implementation of control measures and provides opportunities for improvement based on learnings obtained while operating in the region.				

9. Environmental Performance Outcomes, Performance Standards and Measurement Criteria

As described in section 21(7) of the Environment Regulations, Environmental Performance Outcomes (EPOs) and associated Environmental Performance Standards (EPS) and Measurement Criteria (MC) are used to articulate the specific and measurable benchmarks for environmental performance that Operators are seeking to achieve for the life of the activity.

ConocoPhillips Australia has developed a suite of EPOs that articulate the specific and measurable benchmarks for environmental performance that we are seeking achieve for the life of the activity. These are listed below:

- EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
- EPO2: Commercial marine operators are not economically disadvantaged as a result of the Otway Exploration Drilling Program.
- EPO3: No death or injury to listed threatened or migratory species from the activity.
- EPO4: Biologically important behaviours can continue while the activity is being undertaken.
- EPO5: No substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity.
- EPO6: No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.
- EPO7: No unplanned objects, emissions or discharges to sea or air.
- EPO8: No detectable change to the air quality of coastal communities (Org ID: 72, King Island Shire Council, Event ID: 4014, FB ID: 438).
- EPO9: Anthropogenic noise in biologically important areas will be managed such that:
    - Any blue whale continues to utilise the area without injury, and is not displaced from a foraging area.
    - It does not prevent any southern right whale from utilising the area or cause injury (TTS and PTS) and/or disturbance.
- EPO10: No substantial or unrecoverable change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.
- EPO11: No invasive marine species introduced, established or spread attributable to the activity.

Table 9-1 provides details of the specific control measures that will be implemented to demonstrate that the EPOs can be met. Each control measure has a number of environmental performance standards which document the level of performance that control measures must meet in order to manage impacts and risks to ALARP and an acceptable level, and measurement criteria have been set that will allow the titleholder and NOPSEMA to determine if the performance outcomes and performance standards have been met.

Table 9-1: Environmental performance outcomes, performance standards and measurement criteria for the Otway Exploration Drilling Program

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
CM01: Marine Assurance Process	1.1	The MODU and vessels will meet the safety measures and emergency procedures of Marine Order 21 - Safety and Emergency Arrangements	Vetting Records Assurance Review (Acceptance)
	1.2	The MODU and vessels will meet the navigation equipment, Automatic Identification System (AIS), watchkeeping, radar and lighting requirements of Marine Order 30 Prevention of Collisions.	Vetting Records Assurance Review (Acceptance)
	1.3	The MODU and vessels will meet survey, maintenance, and certification as per Marine Order 31 - SOLAS and non-SOLAS Certification.	Vetting Records Assurance Review (Acceptance)
	1.4	Seafarers on the MODU and vessels will meet training and competency requirements as per Marine Order 70 - Seafarer Certification.	Vetting Records Assurance Review (Acceptance)
	1.5	A documented Preventative Maintenance System (PMS will be in place for equipment on the MODU, vessels and ROV that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures. - Critical equipment on vessels and the MODU will be inspected to ensure effective operation. - Power generation and propulsion systems on the MODU and vessels will be inspected to ensure efficient operation.	Inspection Reports Vetting Records Assurance Review (Acceptance) PMS Reports
	1.6	Vessels and the MODU will comply with Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution (appropriate to vessel class) for emissions from combustion of fuel, including: • Hold a valid Air Pollution Prevention (APP) certification or equivalent in accordance with MARPOL Annex VI. (Vessels with diesel engines>130 kW must be certified to emission standards (e.g. International Air Pollution Prevention [IAPP]). • National (AMSA) and International (IMO / MARPOL) Emissions and Discharge Standards for vessels • Have a Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL 73/78 Annex VI. • Engine NOx emission levels will comply with Regulation 13 of MARPOL 73/78 Annex VI. • Only MARPOL VI-approved waste incinerators shall be used to incinerate solid combustible waste (food waste, paper, cardboard, rags, plastics). • Ozone Depleting Substances (ODS) handling procedures as per MARPOL Annex VI, including maintenance of ODS record book where rechargeable systems containing ODS are recharged or repaired.	Rig Inspection Report Vetting Records Assurance Review (Rig Acceptance)
	1.7	Oil contaminated water shall be treated via a MARPOL (or equivalent) approved oily water separator and only discharge if oil content less than 15 ppm for vessels >400 tonne. Current certificate for system for vessels >400 tonne.	Oil Record Book Vetting Records
	1.8	Sewage discharged at sea shall be treated via a MARPOL (or equivalent) approved sewage treatment system.	MARPOL certification Vetting Records
	1.9	Food waste macerator specifications will be to ≤25 mm and discharges will occur at distances greater than 3 nm from land.	Garbage record book Vetting Records
	1.10	Vessel and MODU contractor prequalification assessments will be conducted in accordance with Marine Risk Management Standard (GMSTD- MA-003).	Vetting Records Assurance Review (Acceptance)
	1.11	Vessels and the MODU will have current anti-fouling certificates in accordance with Marine Order 98: Marine pollution – anti-fouling systems.	Sighting of relevant certificates Vetting Records Assurance Review (Acceptance)
	1.12	Prior to mobilisation to the first drilling location for the program, the MODU and Vessels will comply with the Australian Ballast Water Requirements (Rev 8), specifically, ensuring they have: • a valid Ballast Water Management Plan • a Ballast Water Management Certificate, and • a Ballast Water Record System with a minimum of 2 years records retained on board.	Completed pre-arrival report Ballast Water Management Plan Ballast Water Management Certificate Vetting Records Assurance Review (Acceptance)

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
	1.13	Where vessels and the MODU have mobilised from outside of Australian waters, ballast water will be exchanged outside 12 nm from the nearest land and in water depths greater than 50 m.	Ballast water records Vetting Records Assurance Review (Acceptance)
	1.14	Prior to mobilisation to the first drilling location for the program, the MODU will have a Biofouling Management Plan and Record Book consistent with IMO Biofouling Guidelines.	Biofouling Management Plan Biofouling Record Book Vetting Records Assurance Review (Rig Acceptance)
	1.15	Prior to mobilisation to the Otway Region, an IMS Risk Assessment will be conducted on the MODU and vessels by a qualified IMS inspector.	IMS Risk Assessment Report Vetting Records Assurance Review (Acceptance)
	1.16	Based on the outcomes of each IMS Risk Assessment, management measures commensurate with the risk will be implemented to minimise the likelihood of new IMS being introduced, or established IMS being spread within Australian waters.	IMS Risk Assessment Report Vetting Records Assurance Review (Acceptance)
	1.17	Prior to mobilisation to the Otway Region, the MODU will have received advice on biosecurity, pratique and berthing conditions from the Department of Agriculture, Fisheries and Forestry (DAFF)	Correspondence Vetting Records Assurance Review (Acceptance)
CM02: Vessel and MODU Operating Procedures	2.1	The MODU and vessels will abide by activity exclusion zones in place for other activities in the offshore Otway Basin, to minimise the potential for cumulative impacts.	Operational Log
	2.2	The MODU will conduct drilling activities at one location at a time, to minimise the potential for cumulative impacts.	Operational Log
	2.3	An Environment Plan induction will be delivered to all MODU and vessel personnel.	Induction Induction attendance Records
	2.4	An explosives safety awareness briefing will be included in the Environment Plan induction delivered to all MODU and vessel personnel.	Induction Induction attendance Records
	2.5	AIS will be monitored 24 hours per day - enabling the MODU to receive the data broadcasted by surrounding vessels, such as Maritime Mobile Service Identity (MMSI) number, IMO number, VHF call sign, speed, heading and course over ground. Where an AIS unit is not currently present on a vessel one will be installed, and navigation status will be set correctly.	HSE Inspections Vessel Logs Handover Logs
	2.6	At least one support vessel will remain with the MODU during drilling activities, weather permitting.	Induction Vessel Log
	2.7	Vessel speeds will be restricted to 5 knots within the drilling area and 10 knots within the operational areas.	Induction Vessel Logs No recordable incidents
	2.8	A 500 m Petroleum Safety Zone (PSZ) will be gazetted and monitored around the MODU during the drilling activity.	PSZ gazettal
	2.9	Access into the 500 m PSZ, including approach directions and speed, shall be managed via the MODU.	Vessel Logs
	2.10	A 2 km cautionary zone will be established and monitored around the MODU during the drilling activity.	Consultation and Communication Plan Consultation Records
	2.11	A 500 m Safe Navigation Area (SNA) will be established and monitored around survey vessel(s) and any towed equipment during the seabed survey.	Consultation and Communication Plan Consultation Records

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
	2.12	An avoidance area will be established around the identified research program in VIC/P79 for the duration of the activity and will be communicated to vessel and MODU operators prior to commencement of the activity (Org ID: 508, Blue Whale Study, Org ID: 528, Australian Oceanographic Services Pty Ltd, Event ID: 3194, FB ID: 239).	Vessel Logs Vessel Tracks Consultation Records Induction No recordable incidents
	2.13	Fishing will not be permitted from vessels or the MODU.	Induction Vessel Logs No recordable incidents
	2.14	Vessels will not exchange ballast water within 12 NM from the nearest land and in water depths of less than 50 m unless sourced from Australian waters.	Ballast water records
	2.15	Vessels and aircraft will adhere to the distances and vessel management practices of EPBC Regulations (Part 8 Division 8.1 interacting with cetaceans) and Wildlife (Marine Mammals) Regulations 2009 and will implement an increased caution zone of 500 m between whales and vessels (as described in the Fauna Management Plan (Appendix N) – CM08), to ensure cetaceans are not harmed during offshore interactions with vessels and helicopters.	Fauna Management Plan Conformance checked on receipt of marine fauna sighting datasheets. Induction Package Training records
	2.16	Vessels will maintain 150 m distance from dolphins, marine turtles, seals and flocks of rafting seabirds, as described in the Fauna Management Plan (Appendix N) – CM08. [Updated in response to Matter: M18].	Fauna Management Plan Induction Package Training records
	2.17	Critical equipment on vessels including power generation and propulsion systems and the MODU and vessels will be operated in accordance with manufacturer's instructions and maintained in accordance with the PMS, to ensure effective operation.	Inspection Reports PMS Reports No recordable incidents
	2.18	Systems that generate or treat planned discharges will be operated in accordance with manufacturer's instructions and maintained in accordance with manufacturer's specification as detailed in the PMS, to ensure efficient operation.	Inspection Reports PMS Reports No recordable incidents
	2.19	Waste with potential to be windblown will be stored in covered containers in accordance with Marine Order 95 (Marine pollution prevention – garbage) 2013.	Waste Management plan Garbage record book HSE Inspections Incident Reports
	2.20	Cargo will be packed, loaded, stowed and secured throughout each voyage in accordance with Marine Order 42 (Carriage, stowage and securing of cargoes and containers) 2016, where relevant.	Inspections Incident Reports
	2.21	All lifting gear used for deployment and retrieval of equipment over the MODU and vessels will be load rated for the working load.	Rating Records Load records
	2.22	Incidents of lost materials or waste overboard with potential to affect safe navigation will be reported to the AMSA ARC and other marine users of the relevant operational area.	Incident Reports
	2.23	Spill Containment Equipment: The contractor(s) management system will include provision to maintain spill containment and clean-up equipment aboard the MODU and vessels to prevent releases to the marine environment.	Vetting Records Assurance Review (Acceptance) HSE Inspections Daily Reports
	2.23	Bunkering/Bulk Liquid Transfer Procedure: Bunkering and bulk liquids will be transferred in accordance with Bunkering/Bulk Liquids Procedure(s) to reduce the risk of an unintentional release to sea during transfer. The procedures include standards for: • Certified equipment with checked integrity (e.g. hose and valves). • Transfer process (e.g. safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details)	Vetting Records Assurance Review (Acceptance) Bunkering Records

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
	2.24	All vessels will have a SOPEP/SMPEP (or equivalent appropriate to class) which details: • Response equipment available to control a spill event • Review cycle to ensure that the Plans are kept up to date • Testing requirements, including the frequency and nature of these tests • Reporting requirements and a list of authorities to be contacted • Activities to be undertaken to control the discharge of hydrocarbon (specifically, procedures to stop or reduce the flow of hydrocarbons to be considered in the event of tank rupture), and • Procedures for coordinating with local officials.	Vetting Records Assurance Review (Acceptance)
	2.25	The sulphur content of fuel used by the MODU and vessels will comply with Regulation 14 of MARPOL Annex VI (as appropriate to vessel class) in order to control SOx and particulate matter emissions, namely vessels will use very low sulphur fuel oil (VLSFO) (e.g. maximum 0.50% S VLSFO-DM, maximum 0.50% S VLSFO-RM).	Fuel Supply Contract Bunkering Receipts
	2.26	Bulk Solid Transfer Procedure: Bulk solids will be transferred in accordance with Bulk Transfer Procedures to reduce the risk of an unintentional release to sea during tank venting. The procedures include standards for: • Certified equipment with checked integrity (e.g. hose and valves). • Transfer process (e.g. safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details).	MODU/Vessel inspection
	2.27	Fuel use will be recorded, and combustion emissions will be reported by the relevant facility operator in alignment with the National Greenhouse and Energy Reporting Act 2007 and/or associated international standards.	Bunkering Receipts Daily Report - Fuel Consumption Ship Energy Efficiency Management Plan NGERs Reports (or equivalent)
CM03: Marine and Coastal Users Consultation and Communication Plan	3.1	A Marine and Coastal Users Consultation and Communication Plan will be developed and implemented.	Consultation and Communication Plan Consultation Records
	3.2	Outcomes of the NOPSEMA assessment will be communicated to relevant persons.	Consultation and Communication Plan Consultation Records
	3.3	During the activity relevant persons will be informed about the progress of the activity and any changes at the frequency requested during the preparation of the EP, including a close-out letter at the conclusion of the activities.	Consultation and Communication Plan Consultation Records
	3.4	Specific notifications will be provided as follows, prior to arrival in the operational areas and on departure, so the maritime industry is aware of petroleum activities: • AMSA's Rescue Centre (ARC) (minimum two days prior) - to distribute AusCoast Warning (Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 8, 9) • Australian Hydrographic Office (AHO) (minimum four weeks prior) - to publish Notice to Mariners (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 159; Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 10) • Marine and Safety Tasmania (minimum 4 weeks prior and general updates) (Org ID: 10, Maritime and Safety Tasmania, Event ID: 509, FB ID: 6, 63) • Other relevant Authorities (minimum one week prior) • Ocean Racing Club Victoria for activities scheduled for late-December to early-January (Org ID: 510, Ocean Racing Club of Victoria (ORCV), Event ID: 2617, FB ID: 62) • 48-hour look-ahead provided every 24-hours prior to and during key periods of activity (i.e. transit of rig) (Org ID: 6, Tuna Australia, Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 473)	Consultation and Communication Plan Consultation Records
	3.5	A Safe Operations Guide will be developed and implemented that details pre-activity and on-water communication processes, including SMS messages and radio communication on Channel 16. The guide will be developed based on feedback from consultation with other marine and coastal users during the preparation of the EP and adjustment protocol (see Event/Reg16b IDs below).	Safe Operations Guide Consultation Records

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
	3.6	Fee-for-service arrangement in place with SETFIA to send SMSs to the western distribution list with details of where and when seabed survey, anchor pre-lay and drilling activities are scheduled to occur and regular updates on progress and forecast plans, and what controls (cautionary and exclusion zones) will be in place at set intervals: - 30 days prior to scheduled mobilisation for each activity - 2 weeks prior to mobilisation for each activity - 1 week prior to scheduled mobilisation for each activity - At commencement of each activity - Periodically during each activity	Consultation and Communication Plan Consultation Records
CM04: Commercial Marine Operators Adjustment Protocol	4.1	An Adjustment Protocol will be developed: • In consultation with fishing associations and individual fishers to ensure that commercial fishers' claims can be assessed and compensated. • Based on feedback from consultation with other commercial marine operators who identified they could be potentially impacted by the petroleum activity. (Org ID: 137, Org ID: 138, Event ID: 3984, FB ID: 429; Org ID: 569, Tasmanian Climate Collective, Event ID: 3469, FB ID: 345; Org ID: 462, Mahina Bay Fishing Co Pty Ltd, Event ID: 3432, FB ID: 344; Org ID: 593, Event ID: 2512, FB ID: 168; Org ID: 50, Tasmanian Seafood Industry Council (TSIC), Event ID: 1821, FB ID: 152; Org ID: 433, Event ID: 2663, FB ID: 135; Org ID: 5, Colac Otway Shire Council, Event ID: 582, FB ID: 14; Org ID: 471, Richey Fishing Co Pty Ltd, Event ID: 536, FB ID: 12; Org ID: 490, Event ID: 507, FB ID: 3; Document ID: 3923).	Adjustment Protocol Consultation Records
	4.2	ConocoPhillips Australia will work with other titleholders, fishing associations and fishers, to design an application process for compensation that minimises the potential for cumulative impacts to commercial fishers. (Org ID: 50, Tasmanian Seafood Industry Council (TSIC), Event ID: 1821, FB ID: 149, 150; Org ID: 433, Event ID: 2663, FB ID: 134; Org ID: 36, Victorian Fishing Authority (VFA), Event ID: 2522, FB ID: 87; Document ID: 3923).	Adjustment Protocol Consultation Records
CM05: Cultural Heritage Protection Program (CHPP) A Cultural Heritage Protection Program will be established in consultation with First Nations cultural heritage advisors and indigenous communities with Sea Country within or adjacent to the operational areas, to protect cultural values and sensitivities	5.1	Magnetometer (or gradiometer) survey data and seabed imagery will be reviewed during the seabed survey prior to collection of sediment samples, to support avoidance of ferric metal objects, including unidentified shipwrecks, aircraft and unexploded ordnance (UXO).	Site Survey Records No recordable incidents
	5.2	Seabed survey data and seabed imagery will be analysed by a suitably qualified underwater archaeologist to identify cultural heritage values and sensitivities and inform protection priorities, measures and reporting requirements.	Site Survey Records Underwater Archaeology Report Incident Reports
	5.3	Cultural Heritage Identification and Documentation: The CHPP will fund a process whereby First Nations Persons can identify, record, and document cultural heritage values and sensitivities, such as sites, stories and songlines, within the Otway Exploration Drilling Program area to enhance Indigenous Protected Area (IPA) Sea Country Plans.	Consultation Records Documented Cultural Heritage Protection Program including: - Protection priorities - Measures - Mitigation strategies - Response strategies Contractual/Funding Arrangements
	5.4	Indigenous Community Consultation: The CHPP will be established in consultation with First Nations cultural heritage advisors and indigenous communities.	
	5.5	Cultural Heritage Protection Measures: The CHPP will support the identification of priorities and measures to protect cultural heritage values and sensitivities within the area.	
	5.6	Mitigation and Response: The CHPP will support the development of mitigation and response strategies for identified cultural heritage risks associated with the petroleum activity, reducing the likelihood and consequence of unplanned events with the potential to effect cultural values and sensitivities.	
	5.7	Collaboration: The CHPP shall be open to investment from other parties to further the growth and scope of the program if it continues to be effective.	
CM06: MODU Mooring Plan	6.1a	Seabed surveys will be undertaken prior to finalising MODU position and location of mooring equipment.	Seabed Survey Records
	6.1b	Seabed survey data and seabed imagery will be analysed by a suitably qualified spatial benthic ecologist to identify benthic values and sensitivities and inform protection priorities, measures and reporting requirements. [EPS added in response to Matters: I13, I14 and I18].	Benthic Ecologist Report Mooring Plan
	6.2	ROV surveys will be undertaken prior to installing or removing the wellhead to minimise impacts to seabed features.	ROV Survey Records
	6.3	The Underwater Archaeology Report will be used in the development of the Mooring Plan, prior to finalising MODU position and location of mooring equipment, to avoid identified shipwrecks, aircraft and unexploded ordnance (UXO).	Site Survey Records No recordable incidents
	6.4	API RP 2SK or ISO 19901-7: 2013 – Mooring Analysis: A mooring analysis will be undertaken prior to anchoring to ensure the anchor pattern and any support operations, including use of thruster assisted mooring, are appropriate for the environment, to minimise the risk of anchor slippage which can result in increased benthic disturbance.	Documented Mooring Analysis
	6.5	ISO 19901-7:2013 – Mooring Tensioning: Monitoring of mooring tension will be undertaken while the MODU is anchored on location, to identify potential for anchor slippage which can result in increased benthic disturbance.	Control room logbook/ Database No recordable incidents

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
	6.6	Anchors will be located within the 2 km radius drilling area.	Documented Mooring Plan Anchor position mapping
	6.7	Subsea equipment retrieval: Upon well abandonment, all subsea equipment shall be removed from sea floor, with the exception of sandbags which will be left on the seafloor per USBL deployment requirements, with wellheads cut below mudline and retrieved to surface.	Drilling Report
	6.8	All mooring equipment will be retrieved from the sea floor within 3 months following the completion of the drilling campaign.	Drilling Report
	6.9	Anchors will be equipped with a surface buoy with a navigation light.	Operational Logs
	6.10	AUSCOAST Warnings will be requested for issue by AMSA for anchors equipped with a surface buoy.	Consultation Records AUSCOAST Warning
CM07: Light Management Plan Once safety navigation and operational lighting requirements for minimum lighting to maintain safe operations are met (as per vessel class and activity), the Light Management Plan will detail additional mitigations to manage light based on the information in the Seabird Light Mitigation Toolbox	7.1	ConocoPhillips Australia will contract a suitably qualified specialist to develop and support the implementation of a Light Management Plan, as per the National Light Pollution Guidelines for Wildlife (CoA 2023), for the activity. This Plan will be in place 30 days prior to the commencement of activities within the Operational Areas. [Updated in response to Matters: B10, B11 and B12].	Light Management Plan Qualifications of SQS
	7.2	The Light Management Plan will be developed in consultation with seabird specialists at NRE Tasmania (Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 2521, FB ID: 85).	Consultation Records
	7.3	Outwards facing lighting will be reduced to minimum levels, wherever practicable.	Vetting Records Assurance Review HSE Inspections
	7.4	Directions to minimise non-essential lights (e.g. close blinds, turn lights off when leaving a room etc.) during sensitive timing (e.g. OBP migration season) will be included in the MODU and vessel inductions and periodic toolbox meetings.	Induction HSE Meetings HSE Inspections
	7.5	A program for handling /rescuing grounded birds will be designed and implemented, and crew will be instructed to remain vigilant for seabird collisions	Light Management Plan Induction HSE Meetings
	7.6	Any observed/ discovered incidents will be recorded and reported in the environmental performance report.	HSE Inspections No recordable incidents
	7.7	ConocoPhillips Australia will work with other petroleum titleholders in the Otway Basin with the aim of minimising the potential for cumulative impacts associated with light emissions, should activity timings overlap biologically important periods for light sensitive species.	Light Management Plan Consultation Records
	7.8	Report observation, incidents, and opportunities for improvement regarding light management and bird interactions to other Otway Titleholders.	Light Management Plan MoC Register/Reports Consultation Records
CM08: Fauna Management Plan (FMP) The FMP outlines specific measures to minimise anthropogenic noise threats to relevant species, including the implementation of increased safe operating distances between vessels and whales, pre-activity	8.1	ConocoPhillips Australia will develop and implement a Fauna Management Plan (FMP) for the activity. This Plan will be in place 30 days prior to the commencement of activities within the Operational Areas.	FMP
	8.2	The FMP will be developed in consultation with cetacean specialists, and reviewed with relevant state government departments, in Victoria and Tasmania (Org ID: 33, Environment Protection Authority (EPA) Tasmania, Event ID: 2521, FB ID: 85). [Updated in response to Matter: M26]	Consultation Records
	8.3	ConocoPhillips Australia will work with other petroleum titleholders in the offshore Otway Basin with the aim of minimising the potential for cumulative impacts associated with underwater sound, should activity timings overlap biologically important periods for southern right whales and blue whales.	FMP Consultation Records
	8.4	Observation, incidents, and opportunities for improvement will be reported to other petroleum titleholders in the Otway Basin regarding underwater sound management and whale interactions.	Consultation Records
	8.5	Pre-start actions, start criteria, night-time and low visibility arrangements and noise control actions as detailed in the Otway Exploration Drilling Program Fauna Management Plan (FMP) will be implemented.	Daily Report MFO Report

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
surveys for specific activities, night-time and low visibility controls and establishment of safe points for operational activities in accordance with the Safety Case and Well Integrity requirements (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 40). [Updated in response to Matters: I16, M18, M22, M23, M26, B13, O03].	8.6	**Marine Fauna Observers** • Dedicated MFOs with experience in whale observation, distance estimation and reporting, will undertake observations. • In addition, facility crew who act as Officer of the Watch will receive training from the MFO in whale observation and distance estimation to assist the MMO during daylight hours. • For activities greater than 5 consecutive days at sea with >12 hours daylight, an additional dedicated MFO trained in whale observation, distance estimation and reporting will support the experienced MFO. • As part of the Environment Plan induction all vessel and MODU crew will receive information on the FMP controls and the importance of reporting whale sightings to the vessel MFOs immediately.	MFO CVs MFO reports Training records Induction package Induction records
	8.7	Though the primary method for monitoring for whales is via the MFO on the activity vessels, information to determine the location of whales may also come from other activity vessel MFOs and vessel, MODU and helicopters opportunistic observations.	Daily Report MFO Report
	8.8	Aerial surveys will be conducted by experienced operators, with a proven track record of conducting aerial surveys for blue whales and southern right whales offshore of Victoria and Tasmania.	Survey Team CVs Capability Statement
	8.9	Aerial surveys will extend over the Activity Action Zones, and encompass a boundary extending beyond these zones.	Survey Records Flight Plans and Paths
	8.10	Prior to deploying acoustic detection systems, testing will be completed to validate their reliability and confirm the systems' capability to detect whales, including those emitting low-frequency calls.	Validation Report
	8.11	Report marine fauna collisions via the online National Ship Strike Database as per the National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna.	Consultation records Incident Reports
CM09: Drilling Program The drilling program will align with international best practice standards including the World Bank Environmental, Health and Safety (EHS) Guidelines for Offshore Oil and Gas Development (IFC 2015) - Drilling Fluids and Drilled Cuttings Guidance in regard to pollution prevention and control measures for to discharges to sea including: • Minimising environmental hazards related to residual chemical additives on discharged cuttings by • Careful selection of the fluid system, • Careful selection of drilling fluid additives, taking into account their concentration, toxicity, bioavailability, and bioaccumulation potential.	9.1	Prior to the commencement of the drilling campaign, an assurance check will be undertaken in accordance with the Management of Change Procedure.	MoC Register MoC Reports
	9.2	A cuttings management system with solids control equipment will be in place that uses a closed circulating system to reduce the concentration of drilling mud on cuttings prior to discharge, thereby reducing the total volume of mud discharged to sea. • The shale shakers will be fitted with screens that meet API standards for particle size cut points. • Centrifuges will be used as required to remove additional finer drilled cuttings/solids that are too small for the shale shakers.	Solids control daily reports Daily Drilling reports
	9.3	Drilling Fluids Control Program - Inventory Control: Only residual water-based fluid systems, brine, completion chemicals, cement and cement spacer within MODU mud pits and surface tanks that are no longer required will be diverted overboard.	Daily drilling reports Daily mud reports Drilling fluids end of well report PMS Records
	9.4	Drilling Fluids Inventory Control: Unusable inventories of bulk cement, drilling fluid solid additives, brine and drill water on-board the MODU will be managed according to the procedure.	
	9.5	Drilling Fluids Inventory Control: Inventory will be recycled for reuse before being disposed of overboard, where deemed suitable.	
	9.6	Drilling Fluids Inventory Control: No whole synthetic-based drilling fluids will be discharged overboard.	
	9.7	Drilling Fluids Inventory Control: Remaining synthetic-based drill fluid will be contained on board the MODU for use when drilling future wells.	
	9.8	Drilling Fluids Inventory Control: When unable to be reconditioned offshore, whole synthetic-based drill fluid will be transported to shore for reconditioning.	
	9.9	Cementing Procedure: A Cementing Procedure will be in place to minimise the amount of cement discharged to the marine environment, including: • Provision to mix only enough cement to complete the cementing operation with allowance for loss to formation and • the monitoring and reconciliation of used quantities of cement against planned quantities for each cementing operation.	Documented cementing procedure Cementing Report Daily drilling reports Well management standards

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
• Using high-efficiency solids control equipment to reduce the need for fluid change out, and • Using high-efficiency solids removal and treatment equipment to reduce and minimise the amount of residual fluid contained in drilled cuttings.	9.10a	Unused bulk cement will not be released to the marine environment as a means of disposal where: • It can be transferred to the next MODU titleholder for use in the activities of others, where quality/grade permits; or • It can be safely backloaded to shore at the end of the program, as demonstrated through a documented HSE risk assessment. Where bulk cement cannot be transferred to the next operator or safely returned to shore, it may be mixed with water and discharged as a dilute slurry. Discharges may be minimised through the placement of additional non-barrier plugs within the wellbore, within wellbore volumetric and operational constraints.	Monitoring, reconciliation and backloading records Daily drilling report Bulk/barge report HSE Risk Assessment Consultation records
	9.10b	Unused bulk bentonite and/or barite will not be released to the marine environment as a means of disposal where: • It can be transferred to the next MODUs titleholder for use in the activities of others, where quality/grade permits; or • It can be safely backloaded to shore at the end of the program, as demonstrated through a documented HSE risk assessment. Where bulks cannot be transferred to the next operator or safely returned to shore, they may be mixed with water and discharged as a dilute slurry.	Monitoring, reconciliation and backloading records Daily drilling report Bulk/barge report HSE Risk Assessment Consultation records
	9.11	Solids Control Equipment (SCE) will be used to recondition and recycle non-aqueous drilling fluids and reduce the residual fluid on cuttings (ROC)% to ≤8% ROC (dry weight) per well section prior to overboard discharge.	Retort test results
	9.12	Retained oil on cuttings (ROC) will be monitored every 300 m whilst drilling with non-aqueous based drilling fluids or twice daily (whichever comes first).	
	9.13	Where losses are anticipated, drilling fluid will contain an engineered bridging agent to create a seal at the drilling fluid/formation interface to reduce the likelihood of fluid losses (Org ID: 13, King Island Marine Research, Event ID: 3129, Reg16b: 290, 291, 293).	Daily drilling reports Daily mud reports Drilling fluids end of well report
	9.14	The BOP will be routinely function and pressure tested in accordance with Industry Standard API-53: 2018, manufacturer's specifications and in alignment with Drilling Contractors preventative maintenance system, to minimise discharges of dilute water-soluble hydraulic fluid.	BOP maintenance records PMS Records
	9.15	Pre-operational function and pressure tests of the BOP will be conducted and may be witnessed by additional third-party prior to campaign.	BOP third party verification records
	9.16	VSP equipment will be operated in accordance with manufacturer's instructions and ongoing preventative maintenance to ensure efficient operation.	Inspection Reports PMS Reports
	9.17	Wireline extended reservoir evaluation, with associated venting of reservoir gas, may be conducted if suitability of method for application to specific reservoir is confirmed during the drilling program.	Daily drilling reports Vented volumes
	9.18	Initiate drilling with a minimum 15 minute duration soft-start procedure, whereby drilling commences at a slower rate to minimise downhole vibrations and torque, effectively reducing the initial sound levels from this activity and allowing for fauna to move away. [EPS added in response to Matter: M35].	Daily drilling reports
CM10: Well Testing Program	10.1	Flaring will be limited to a maximum of 120 hours per well.	Operational Log
	10.2	For each well test, the initial flaring event will commence during daylight hours to reduce the impact of the initial event. However, the timing of subsequent events at each well will be determined by operational safety and testing requirements.	Operational Log
	10.3	Prior to the commencement of the initial flaring event at each well, the area extending from the tip of the flare will be visually confirmed clear of birds.	Operational Log Incident Reports
	10.4	Flaring durations and hydrocarbon volumes flared will be recorded and combustion emissions reported by the relevant facility operator in alignment with the National Greenhouse and Energy Reporting Act 2007 and/or associated international standards.	Operational Log Flared volumes NGERs Reports (or equivalent)

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
CM11: Procurement Vetting Process	11.1	A flaring system with air compressors will be used to atomise hydrocarbons to minimise smoke during combustion and aid in the reduction of atmospheric emissions.	Minimum equipment requirements Vetting Records Assurance Review (Acceptance)
	11.2	A minimum standard for the destruction efficiency of the flare will be specified in the minimum equipment requirements.	Minimum equipment requirements
	11.3	VSP equipment will be inspected prior to deployment and confirmed operation in accordance with manufacturer's specifications.	Inspection Reports Vetting Records Assurance Review
	11.4	Third party equipment used to treat planned discharges, e.g. centrifuges, cuttings driers, etc will be verified as fit for purpose.	Vetting Records Assurance Review (Third-party Acceptance)
	11.5	The seabed survey contract will require the collection of representative sediment samples from grab samples collected to validate geophysical survey data, with storage and transport onshore for benthic analysis. (Org ID: 9, University of Tasmania (UTAS), Event ID: 43, FB ID: 7; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 382, 384, 387; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 357).	Seabed Survey Contract Site Survey Records Analysis Reports
	11.6	During procurement of aviation services, an assessment of operational considerations to prevent bird collisions will be conducted.	Procurement vetting records Incident Reports
CM12: General and Hazardous Chemical Management Procedures	12.1	Chemical Management Procedures for general and hazardous chemicals and hydrocarbons, will be in place, including requirements for: • Chemical selection process • Safety data sheet (SDS) being available for all chemicals • Storage, handling and use • Deck drain management • Inspections • Non-compliances and incidents • Process to isolate hazardous chemicals remaining on board from previous operations.	HSE Inspections Vetting Records Assurance Review (Acceptance) No recordable incidents
	12.2	A Chemical Selection Procedure will be in place to ensure chemicals that have the potential to be discharged to the marine environment are rated Gold/Silver/D or E through Oslo and Paris Conventions (OSPAR) and Offshore Chemical Notification Scheme (OCNS) or have a complete risk assessment.	Chemical Management Procedure Completed and approved chemical assessment Approved Chemical Register No recordable incidents
	12.3	Materials and equipment that have the potential to spill onto the deck or marine environment will be stored within a contained area.	HSE Inspections Daily Reports No recordable incidents
	12.4	Barite Quality Standard: Barite will adhere to the IFC EHS guidelines (2015) effluent levels of 1 mg/kg of Hg (dry weight) and no more than 3 mg/kg of Cd (dry weight). (Org ID: 13, King Island Marine Research, Event ID: 3129, FB ID: 283, 304, 313, 333)	Testing records Daily drilling reports Daily mud reports
CM13: NOPSEMA Accepted Oil Pollution Emergency Plan (OPEP)	13.1	Emergency spill response capability will be maintained in accordance with the accepted OPEP. (Org ID: 111, Australian Marine Conservation Society, Event ID: 4153, FB ID: 455)	Outcomes of internal audits and tests demonstrating preparedness
	13.2	Spill response will be implemented in accordance with relevant EPOs and EPS in the accepted OPEP.	EMT/IMT Log Incident Action Plan
CM14: Operational and Scientific Monitoring Program (OSMP)	14.1	Operational and scientific monitoring capability will be maintained in accordance with the OSMP.	As per OSMP
	14.2	One month prior to the commencement of drilling a review of the contracted OSMP provider(s) capability will be undertaken to ensure that the OSMP requirements can be met.	Capability Review
	14.3	The contracted OSMP provider(s) capability to meet the requirements detailed in the OSMP will be tested prior to commencing drilling.	Capability Test Report

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
	14.4	During drilling the contracted OSMP provider(s) will provide a monthly report to show that capability as detailed in the OSMP is maintained.	OSMP Monthly Report
CM15: Well Design and Delivery Process (WDDP) The WDDP shall be applied to manage operational risks associated with drilling to ALARP; document changes to drilling design and implementation; demonstrate alignment with relevant well design and drilling standards; and track organisational competency for ConocoPhillips Australia drilling personnel.	15.1	Well construction and abandonment processes will be implemented in accordance with the ConocoPhillips Well Engineering Design and Construction Standards and Manuals to manage operational risks associated with drilling to ALARP, including, but not limited to: • Well Construction and Intervention Standard • Well Management Standard • Well Control Manual • Casing and Tubing Design Manual • Well Design and Delivery Process Manual • Well Integrity Manual • Wells Competency Management Manual	Well Design and Delivery Process Records Well Acceptance Criteria Accepted WOMP Daily Reports
	15.2	Well Design and Plan Approval: All aspects of risk profiling, well construction and abandonment design will be peer reviewed and approved by ConocoPhillips management at each stage.	Well Design and Delivery Process Records
CM16: Source Control Emergency Response Plan (SCREP), inclusive of Relief Well Plan	16.1	Prior to drilling each well covered under this EP, there will be a campaign-specific source control plan in place.	SCERP
	16.2	Prior to campaign commencement a register of suitable relief well MODU's will be compiled and then maintained and updated on a 14 day basis.	Relief well capability register confirms MODU availability
	16.3	Emergency response capability to implement an effective well kill operation will be maintained in accordance with the SCERP.	Outcomes of internal audits and tests/drills demonstrating preparedness
	16.4	The SCERP will be consistent with the International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019), specifically detailing: • The structure and function of the wells Emergency Team (WET) • A timeline for the effective implementation of source control key events / actions • A well-specific worst-case discharge (WCD) analysis • Gas plume study • Relief well plan including dynamic kill analysis • APPEA MoU to be in place for mutual assistance i.e. relief well planning.	SCERP
	16.5	Relief Well Design Assessment (pre-drilling): An assessment to identify and screen relief well spud locations will be conducted prior to the drilling campaign to reduce the time taken to plan and execute a relief well, thereby reducing environmental impacts.	Seabed surveys of relief well locations Documented campaign relief well plan developed in line with OGUK guidance prior to drilling.
	16.6	A pre-purchase or access agreement will be in place for relief drilling supplies, including long-lead items such as casing, casing shoes and wellhead equipment, to reduce relief well drilling times reducing environmental impacts.	Access Agreement Equipment inventory
	16.7	A contract will be in place to support hot stab and/or direct well intervention via ROV (via either ROV available on rig and/or additional ROV to be supplied) using source control equipment and trained personnel from contracted company.	AMOSC SFRT membership ROV Contract
	16.8	Prior to intersecting the target reservoir at each well, ConocoPhillips Drilling and Completions Source Control Branch Director will be identified and confirmed as available to be activated within 2 hours, should activation of the IMT occur	IMT Roster during activity Training and Exercising
	16.9	Prior to intersecting the target reservoir at each well, ConocoPhillips Drilling and Completions Source Control Team will be identified and confirmed as available to be activated and mobilised within 24 hours, should activation of IMT occur.	
	16.10	Contract(s) and memorandums of understanding (MOU) will be in place for source control personnel.	Global agreement with Well Control Specialist Signed APPEA MOU

Control Measure	EPS ID	Environmental Performance Standard	Measurement Criteria
	16.11	Prior to intersecting the target reservoir at each well, Well Control Specialists will be identified and confirmed accessible remotely within 24 hours with mobilisation within 72 hours, should activation of the IMT occur, to support diagnosis of well condition and development of remedial action options.	Training and Exercising
	16.12	Membership will be in place for the AMOSC Subsea First Response Toolkit (SFRT), which provides for surveillance, debris clearance and trained responders, as well as subsea dispersant application.	AMOSC SFRT membership
CM17: NOPSEMA Accepted Well Operations Management Plan	17.1	Well integrity shall be maintained in accordance with the NOPSEMA accepted Well Operations Management Plan	NOPSEMA accepted WOMP in place
CM18: Financial assurance for offshore activity (Org ID: 593, Event ID: 3133, FB ID: 262)	18.1	ConocoPhillips Australia will hold financial assurance for the Otway Exploration Drilling Program, as per the OPGGS Act and the Environment Regulations for undertaking a petroleum activity under a petroleum title. The FA will be calculated using an independently validated, NOPSEMA-endorsed method to estimate the greatest reasonably credible costs, expenses and liabilities associated with response, clean up, and monitoring the impacts of an escape of petroleum; and will be available in an appropriate form, maintained and accessible.	Financial Assurance Declaration to NOPSEMA (FM1519) Financial Assurance Confirmation submitted to NOPSEMA (FM1465) prior to acceptance of the environment plan MoC events

10. Implementation Strategy

Section 22(1) of the Offshore Petroleum and Greenhouse Gas (Environment) Regulation (2023) (Environment Regulation) requires that the Environment Plan (EP) contains an implementation strategy for the activity. Section 22(16) requires that the implementation strategy must comply with the Act, the Regulations and any other environmental legislation applying to the activity.

This implementation strategy contains a description of ConocoPhillips Australia's Health, Safety and Environmental Managemental System (HSEMS), including specific measures that will be used to ensure that, for the duration of the activity:

- The environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable (ALARP), and
- Control measures detailed in the EP are effective in reducing the environmental impacts and risks of the activity to ALARP and an acceptable level, and
- Environmental performance outcomes and standards set out in the EP are being met.

The regulatory requirements of the implementation strategy are cross-referenced in Table 10-1 below.

Table 10-1: Regulatory requirements of the implementation strategy

Regulation Section 22 Requirement	Implementation Strategy Section
Providing for environmental performance reporting requirements for the activity, with the interval between reports not more than 1 year.	Section 10.5.5
Describing the HSEMS for the activity, including specific measures to be used to ensure: (a) the environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable; and (b) control measures detailed in the EP are effective in reducing the environmental impacts and risks of the activity to ALARP and an acceptable level; and (c) environmental performance outcomes and standards set out in the EP are being met.	Section 10
Establishing a clear chain of command, setting out the roles and responsibilities of personnel in relation to the implementation, management and review of the EP, including during emergencies or potential emergencies.	Sections 10.1.3 and 10.1.4
Providing measures to ensure each employee or contractor working on, or in connection with, the activity is aware of their responsibilities in relation to the EP, including during emergencies or potential emergencies, and has the appropriate competencies and training.	Sections 10.1.4, 10.2.3 and 10.2.4
Providing for sufficient monitoring, recording, audit, management of nonconformance and review of environmental performance and the implementation strategy to ensure that the environmental performance outcomes and standards in the EP are being met.	Section 10.5
Providing for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (during normal operations or otherwise), to assess whether the environmental performance outcomes and standards in the EP are being met.	Section 10.5.4
Providing for an oil pollution emergency plan, and updating and testing of the plan consistent with the national system for oil pollution preparedness and response.	Section 10.4 and Appendix I
Providing for monitoring of impacts to the environment from oil pollution and response activities.	Section 10.4.6
Providing for appropriate consultation with relevant authorities of the Commonwealth and State, and other relevant interested persons or organisations.	Sections 10.2.5 and 10.5.5
Complying with the Act, the regulations and any other environmental legislation applying to the activity.	Sections 10.1.5, 10.2.6 and 10.2.7

The Otway Exploration Drilling Program will be conducted in accordance with the ConocoPhillips Corporate (ConocoPhillips) HSE Policy and HSEMS Standard and has considered lessons learnt from the implementation of previous exploration activities and inspection recommendations.

10.1. ConocoPhillips HSEMS

The ConocoPhillips HSEMS Standard outlines requirements for implementing HSE Policy, leadership expectations and SPIRIT Values of Safety, People, Integrity, Responsibility, Innovation and Teamwork. ConocoPhillips' operations include a wide range of activities and assets, each with a unique set of operating conditions, risks and regulatory requirements. Consequently, the Standard seeks to promote a structured framework for consistently achieving requirements whilst supporting delivery using methods that are fit for purpose and risk-based for specific operations and activities.

The individual elements of the HSEMS (policies, procedures, etc), combine to provide a continuous improvement process based on the four phases of the management cycle: Plan, Do, Assess and Adjust:

- PLAN: identifies the hazards, impacts, risks, regulatory requirements and mitigations necessary for HSE effectiveness. The elements in this step also establish strategic plans, goals, and objectives.
- DO: describes the specific implementation tools needed to manage impacts, risks and other requirements identified in the PLAN phase.
- ASSESS: describes detailed monitoring and auditing to ensure that impacts, risks and other requirements are being identified, assessed, and managed.
- ADJUST: requires review of the HSEMS, its implementation, and effectiveness to identify strengths, gaps, and opportunities for continuous improvement.

The HSEMS elements are shown in Table 10-2 and are described and expanded in the following sections in the context of the ConocoPhillips Australia Otway Exploration Drilling Program.

Table 10-2: ConocoPhillips' Health, Safety and Environmental Management System Standard

HSEMS	
Policy and Leadership - HSE Policy, Leadership and Responsibility - Legal Requirements and Standards of Operation	Functional Areas (DO) - Environment - Crisis Management and Emergency Response
Preparation and Documentation (PLAN) - Strategic Planning, Goals and Objectives - Risk Assessment and Management - Competency and Training - Communications - Document Control and Records	Continuous Improvement (ASSESS & ADJUST) - Investigations, Learning and Corrective Actions - Measuring and Monitoring - Audits - Review and Adjust

10.1.1. HSE Policy

ConocoPhillips' HSE Policy is the company's highest-level HSE document. It establishes the expectations, principles of operation and desired results for ConocoPhillips businesses including exploration activities.

- The Corporate VP - HSE shall ensure the HSE Policy is reviewed every 3 years and updated as necessary.
- Each Business Unit and Function (BU&F) shall execute the requirements and principles of the HSE Policy. BU&F may include additional requirements.
- Each BU&F shall verify the HSE Policy is accessible, communicated, understood and implemented.
- The ConocoPhillips HSE Policy shall be provided and promoted, as appropriate, to external stakeholders.

In accordance with section 24(a) of the Environment Regulation, ConocoPhillips' HSE Policy is provided in Appendix M. The HSE Policy provides a public statement of the company's commitment to minimise adverse effects on the environment and to improve environmental performance. It establishes the expectations, principles of operation and desired outcomes for the company and its subsidiaries. The policy is distributed to all company facilities and contracted parties.

10.1.2. Other Key Policies, Principles and Positions

10.1.2.1. Sustainable Development Policy and Climate Change Position

ConocoPhillips Sustainable Development (SD) Policy establishes SD principles and requirements that direct business decisions for exploration, drilling and production activities to assure SD risk management, strategic planning, governance and disclosure. Our core mission is to develop energy supply essential to human and economic progress, while effectively managing social and environmental concerns including climate change.

ConocoPhillips is committed to meeting the triple challenge of taking action on climate-related risk, improving lives by meeting society's demand for energy and making sustainable financial investments in order to become the energy company of choice for all stakeholders including investors, employees, governments, customers and the communities where we operate.

We acknowledge the findings of the Intergovernmental Panel on Climate Change that greenhouse gas (GHG) emissions from the use of fossil fuels contribute to increases in global temperatures. We acknowledge the importance that current science places on limiting global average temperature increases to below 2-degree Celsius compared to pre-industrial times, and to achieve that, current science shows that global GHG emissions need to reach net-zero in the second half of this century. We support the Paris Agreement as a welcomed global policy response to that challenge, and believe the most effective tool to reduce GHG emissions across the economy is through a well-designed emissions pricing regime.

ConocoPhillips Australia is committed to reducing our GHG intensity through emissions reductions and efficiencies and supporting practical, sustainable climate policy solutions in line with our 'net-zero by 2050' ambition.

10.1.2.2. Principles of Environmental Justice

ConocoPhillips believes the primary purpose of environmental justice policy should be to create and maintain inclusive, transparent and mutually beneficial relationships among stakeholders. We are focused on sustainably meeting energy demand, while creating lasting value for the communities in which we operate, our shareholders and our employees.

ConocoPhillips Australia is committed to respectfully engaging with Otway stakeholders to understand how their functions, interests and activities and the unique values and sensitivities of the environmental planning area that may interact with aspects of our activity. We seek to integrate consultation feedback into our plans and activities, to reduce the impact of our operations and contribute to meaningful economic development. Through consultation, we will work to balance factors relevant to other marine and coastal users – such as access, existing structures, distance from communities, metocean conditions and environmental values and sensitivities – and will work to mitigate impacts and risks when planning our activities.

We recognise that vulnerable communities may be at greater risk from the impacts of industrial activities, and believe all people – regardless of race, colour, national origin, or income – should be treated fairly with respect to the development, implementation and enforcement of environmental laws, regulations, and policies. ConocoPhillips Australia will undertake to develop and implement a consultation framework that supports inclusiveness and equal opportunity and access for the Otway exploration drilling program. More information on our commitment to the principles of environmental justice can be found HERE.

10.1.2.3. Biodiversity Position

ConocoPhillips recognises the importance of managing biodiversity risks associated with our global operations and demonstrating leadership in habitat stewardship practices. We will not operate exploration, development, drilling or production activities in habitats of significant importance to critically endangered species, or other critical habitat, unless we can adequately mitigate impacts through mitigation hierarchy measures in accordance with our sustainable development management system, regulatory requirements and through local engagement.

ConocoPhillips Australia recognises the unique environmental values and sensitivities of the Otway region, and is committed to managing risks and mitigating impacts to biodiversity associated with our activities in line with our Biodiversity Position, by:

- Applying a science-based approach and considering cumulative effects to develop leading best practices as described through-out the impact and risk assessment Environment Plan chapters and Cumulative Impact Assessment chapter.
- Collecting data and information on local biodiversity through site assessments and baseline studies through the implementation of multi-year marine mammal survey program, the completion of studies on giant crabs and southern rock lobsters and by supporting citizen science and coastal southern right whale research programs.
- Developing indicators and metrics to track biodiversity impacts and risk management performance through the development of control measures, environmental performance standards and measurement criteria.

- Applying technological innovation and practical, sustainable solutions for biodiversity conservation through, for example, coordinating citizen science and aerial survey program for marine mammals.
- Collaborating with conservation organisations, governments, and policy bodies by, for example, providing data to state government departments to improve understanding on species presence and federal government departments to support the review of biologically important areas.
- Engaging with local communities on biodiversity-related impacts associated with our operations, mitigation actions and proactive initiatives to support biodiversity conservation through community information sessions and funding for citizen science programs.

This section was updated in response to feedback received during consultation to include information specific to the Otway Exploration Drilling Program (Org ID: 111, Australian Marine Conservation Society, Event ID: 4153, FB ID: 462; Org ID: 524, Wilderness Society, Event ID: 3480, FB ID: 399; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 368).

10.1.3. Leadership

Leaders are required to demonstrate a commitment to eliminating HSE incidents and continuous HSE improvement. Exploration activity leaders are required to:

- Become familiar with HSEMS requirements and ensure implementation.
- Identify, communicate, and implement key HSE processes and procedures.
- Lead by example, set clear expectations and empower their employees and contractors to fulfill their HSE responsibilities.
- Maintain awareness of what happens in the field by regularly engaging personnel to verify critical controls are utilised, functioning as intended and address HSE issues and concerns. Engagements may include:
- Leadership field visits
- Life Saving Rule verifications
- Process Safety Fundamental discussions
- Environmental performance and compliance verifications
- Be actively involved in investigations and learning processes. Ensure effective barriers are implemented when required.

10.1.4. Responsibilities and Organisational Structure

ConocoPhillips Australia maintains a structured organisation to manage HSE issues that impact on, or have the potential to impact on the Otway Exploration Drilling Program, including:

- Maintaining a specialist HSE team
- Communicating organisation charts outlining the resourcing and management structure for ConocoPhillips Australia
- HSE committees that function at multiple levels to review and manage HSE related issues
- Conducting management reviews of the ConocoPhillips HSEMS to assess resource needs
- Implementing specific processes that identify and effectively communicate roles, responsibilities and accountabilities associated with critical equipment and systems including via inductions, on-boarding processes and competency training programs, and
- Documenting roles, responsibilities and accountabilities, as they relate to the HSEMS and the HSE Policy.

The roles and responsibilities of key personnel for the implementation, management and review for this EP are detailed in Table 10-3.

Table 10-3. Otway Exploration Drilling Program roles and responsibilities

Role	Key HSE Responsibilities
Onshore	
ConocoPhillips Australia President	Ensures: - ConocoPhillips Australia has the appropriate organisation in place to be compliant with - regulatory and other requirements and this EP. - Policies and systems are in place to guide the company's environmental performance. - Adequate resources are in place for the safe operation of all activities. - The HSEMS continues to meet the evolving needs of the organisation.
ConocoPhillips Australia Exploration Manager	Ensures: - The activity is undertaken as per the Environmental Performance Outcomes (EPO) of the EP. - Sufficient resources are allocated to implement control measures to achieve the EPOs. - Consultation is undertaken as per the requirements of the EP. - Change requests for the activity are managed and the Client Representative, HSE General Manager and Marine Fauna Observers (MFOs) are notified of any scope changes in a timely manner. - Liaison with regulatory authorities is undertaken as required. - The EP is reviewed as necessary and updated as required. - Environmental incident reporting meets regulatory requirements, e.g. all reportable and recordable incidents are reported to NOPSEMA. - Corrective actions raised from environmental inspections/audits or incidents are monitored and closed out. - Necessary resources are provided to facilitate an emergency response strategy in the event of an incident. - The ConocoPhillips emergency response strategy is implemented in the event of an incident. - Results of compliance audits are reviewed and recommendations for improvement are implemented where required. - An activity induction is provided to all activity personnel, including details of the environmental values and sensitivities of the operational areas and the EPOs, Control Measures and Environmental Performance Standards (EPS) detailed in this EP. - Annual and end-of-activity environmental performance reports are prepared and submitted to NOPSEMA.
ConocoPhillips Australia HSE General Manager	Ensures: - Compliance with HSE regulatory requirements. - An EP is prepared for the activity. - Environment Officer(s) is/are appointed to oversee implementation of the EP. - Records associated with the activity are maintained. - Personnel who have specific responsibilities pertaining to the implementation of this EP, and other environmental regulatory requirements, know their responsibilities and are competent to fulfil their designated role. - Environmental impacts and risks associated with the activity have been identified and any new or increased impacts or risks are managed via the Management of Change (MoC) process. - Any changes to equipment, systems and documentation where there may be a new, or change to, an environmental impact or risk or a change that may impact the EP are assessed and documented in accordance with the MoC process. - Oil spill response arrangements for the activity are tested. - The environmental component of the activity induction is prepared and presented. - Environmental incidents are reported and managed. - Monthly environmental incident reports during the activity, annual and the end-of-activity environmental performance reports are prepared and submitted to NOPSEMA.

Role	Key HSE Responsibilities
	- Audits and inspections are undertaken and any actions from non-conformances or improvement suggestions are tracked to completion. - Reviews and revisions are made to the EP as required.
ConocoPhillips Australia Government and External Affairs General Manager	Ensures: - Consultation and Communication Plans for the activity are prepared, implemented and maintained. - Objections and claims are recorded and reported to the Project Manager and Environment Lead and are promptly addressed. - Records of consultation are maintained. - Consultation continues for the duration of the activity, and is ongoing, as required.
Offshore	
ConocoPhillips Australia Offshore Representative	Ensures: - The activity is carried out in accordance with regulatory requirements and this EP. - MODU and vessel personnel partake in the activity induction. - MODU and vessel personnel are competent to fulfil their designated role. - HSE issues are communicated via mechanisms such as the daily report and daily pre-start meetings. - New or increased environmental impacts or risks are managed via the MoC process. - HSE incidents are reported and investigated. - Emissions and discharges are identified and recorded. - The ConocoPhillips HSE General Manager is informed of any changes to equipment, systems and documentation where there may be a new or change to an environmental impact or risk or a change that may impact the EP. - Weekly HSE MODU and vessel inspections are undertaken to ensure ongoing compliance with the EP and environmentally critical plant and equipment are in good working order.
MODU Master	Ensures: - Operations are carried out in accordance with regulatory requirements and this EP. - Operations personnel are competent to fulfil their designated role. - Personnel new to the MODU and vessels receive an activity-specific induction. - Environmental incidents are reported to the ConocoPhillips Australia Offshore Representative within required timeframes. - Emissions and discharges and identified, recorded and provided to the ConocoPhillips Australia Offshore Representative. - The ConocoPhillips Australia Offshore Representative is informed of any changes to equipment, systems and documentation where there may be a new or change to an environmental impact or risk or a change that may impact the EP. - Spill response arrangements are in place and tested as per the MODUs SOPEP/SMPEP. - General and hazardous wastes are backloaded to port for disposal to a licenced waste facility. - Weekly HSE meetings are conducted.
Vessel Masters	Ensure: - Vessel operations are carried out in accordance with regulatory requirements and this EP. - Vessel personnel are competent to fulfil their designated role. - Personnel new to the vessel receive an activity-specific induction. - Environmental incidents are reported to the ConocoPhillips Australia Offshore Representative within required timeframes. - Emissions and discharges are identified, recorded and provided to the ConocoPhillips Australia Offshore Representative. - The ConocoPhillips Australia Offshore Representative is informed of any changes to equipment, systems and documentation where there may be a new or change to an environmental impact or risk or a change that may impact the EP.

Role	Key HSE Responsibilities
	- Spill response arrangements are in place and tested as per the SOPEP/SMPEP. - General and hazardous wastes are backloaded to port for disposal to a licenced waste facility. - Weekly HSE meetings are conducted.
Marine Fauna Observers	Ensure: - MODU and vessel crews are briefed about their role in supporting the MFOs to fulfil their duties. - The Fauna Management Plan is implemented. - Marine fauna sightings and any actions taken are documented. - Continuous liaison is maintained with the Party Chief and the ConocoPhillips Australia Offshore Representative regarding marine fauna control measures. - An end-of-activity MFO report is prepared for submission to the ConocoPhillips Australia Environment Officer.
Contractor Party Chiefs (Offshore)	Ensure: - MODU and vessel management systems and procedures are implemented. - Personnel starting work on the MODU and support vessels receive an induction that meets the requirements specified in this EP. - Personnel are competent to undertake the work they have been assigned. - Emergency drills are conducted as per the vessel schedules. - The MODU and vessels' emergency response teams have been given sufficient training to implement SOPEP/SMPEP. - Environmental incidents or breaches of performance outcomes, control measures or environment performance standards, are reported immediately to the Offshore Representative. - MODU and vessel crew are briefed about their role in supporting the MFOs to fulfil their duties.
MODU and Vessel Personnel	MODU and vessel crews are responsible for: - Completing the ConocoPhillips activity-specific induction. - Reporting fauna sightings and interactions to the MFOs. - Reporting hazards and/or incidents via company reporting processes. - Adhering to the MODU and vessel's HSEMS and this EP. - Undertaking tasks safely and without harm to themselves, others, equipment or the environment in accordance with their training, operating procedures and work instructions. - Stopping any task that they believe to be unsafe or will impact on the environment.

10.1.5. Legal Requirements and Standards of Operation

ConocoPhillips Australia is required to comply with ConocoPhillips' corporate HSE policies, standards and practices. In addition, ConocoPhillips Australia is required to comply with all applicable HSE legal requirements relevant to the Otway Exploration Drilling Program and supporting operations in the offshore Otway Basin including, but not limited to, laws, regulations, permits, project approvals and orders.

ConocoPhillips Australia has an HSE and Other Legal Requirements Procedure which documents the process to identify, monitor and assure compliance and address changing legal requirements. A project-specific tool has been developed to capture relevant legislation and other requirements for the activity and is included in Appendix A. This tool will be reviewed within 2 months prior to the commencement of the activity and in line with the procedure (currently 6-monthly) thereafter, and will be accessible by exploration employees and internal contractors.

10.1.6. Contractor and Supplier Management Process

Whilst ConocoPhillips Australia holds an 80% interest in and operatorship of Exploration Permits T/49P and VIC/P79, respectively, and is the titleholder for the activity, drilling rig and vessel contractors maintain operational control over their specific operations as per the requirements of their management systems.

Contractors undertaking work on behalf of ConocoPhillips Australia are required to have systems and procedures that align with the ConocoPhillips HSE Policy and the HSEMS Standard to ensure environmental performance outcomes and standards are achieved. Where required, this shall be managed through bridging documentation, such as an activity specific HSE Plan, to address any procedural gaps.

The ConocoPhillips Global Marine Risk Management Standard (GM-STD-MA-003) requires marine assurance approval for marine facilities (MODU) and vessels prior to the commencement of the charter and for the duration of activities performed for ConocoPhillips Australia. The vetting and audit process for offshore facilities and vessels details the requirements and procedures that are used to ensure that risks involved in marine activities are effectively managed, consistent with ConocoPhillips Australia's vision for safety, health, environment, reliability and efficiency. These establish the expectations and processes by which ConocoPhillips Australia can ensure that facilities and vessels are fit for purpose, suitable for the nominated scope of works and comply with and are operated in accordance with applicable local, national, international and HSE Policy requirements.

10.2. Preparation and Documentation (PLAN)

10.2.1. Strategic Planning, Goals and Objectives

Planning at ConocoPhillips Australia cascades from the corporate level to individual functions, including HSE, Governance and Capital Projects. The Otway Exploration Drilling Program HSE planning process will include the development and implementation of plans that are resourced, communicated and measured to contribute to continuous HSE improvement and the reduction of HSE risk. These plans will be developed through consultation with the seabed survey and drilling activity contractors.

10.2.2. Impact and Risk Assessment and Management

ConocoPhillips Australia utilises a Risk Management Overview Procedure and supporting processes and tools to identify, evaluate and manage HSE impacts and risks. These processes are applied in impact and risk assessments with outputs such as identified impacts, risks, rankings and mitigations documented (in this case in the EP).

Once the impact and risk assessments have been performed, resulting impacts and risks are managed in accordance with ConocoPhillips Risk Matrix Standard and regulatory requirements, and outcomes are and communicated to those potentially affected and those accountable for mitigation.

All plans that address impact and risk, including the EP, are subject to periodic review and update in accordance with the Management of Change (MoC) Procedure. A range of events may also trigger the need for update including audits, inspections, internal and external learnings and/or changes to company policies, strategies and regulatory requirements.

The impact and risk assessment methods used are appropriate for the nature and magnitude of the impacts and risk being evaluated, with consideration given to corporate standards, Australian regulations and recognised national and international standards. For EP development, environmental hazard identification (ENVID) is conducted, followed by environmental impact and risk assessments. The level of detail required to be included in assessments is proportional to the hazards or potential consequences of impacts and risk associated with the activity.

For this activity, ConocoPhillips Australia has determined that impacts and risks are defined as:

- Impacts – A change to the environment, whether adverse or beneficial, that wholly or partly results from an activity. Impacts are an inherent part of the activity and are expected to result in environmental consequences that can be assessed. For example, underwater sound will be generated during seabed surveys and drilling operations and this will have consequences for marine life.
- Risks – A change which could occur to one or more environmental receptors, that is caused either wholly or partly by one or more environmental aspects associated with an activity. Environmental risks have a degree of likelihood, and are not certain to occur. For example, a hydrocarbon spill may occur if two vessels collide, but neither the collision nor the spill is certain to occur. The risk of this event is determined by multiplying the consequence of the impact (using factors such as the type and volume of hydrocarbons and the nature of the receiving environment) by the likelihood of this event happening (which may be determined objectively or subjectively, qualitatively or quantitatively). For risks, the consequence and likelihood are combined to determine the risk rating.

ConocoPhillips Australia conducts impact and risk assessment in accordance with the methodology described in detail in Section 5 of the EP.

10.2.3. Competency and Training

ConocoPhillips Australia's competency and training processes are documented in the ABU Training and Competency Assurance Philosophy (ABU-000-TC-M05-O-00001) and Training Matrix.

Each employee or contractor with responsibilities pertaining to the implementation of this EP shall have the appropriate competencies to fulfil their designated role and shall be made aware of their responsibilities and the necessary control measures to maintain environmental performance and compliance.

All offshore personnel will be required to complete an environmental induction, with records of completion maintained, covering:

- Description of the existing environment and its values and sensitivities
- Controls to be implemented to ensure impacts and risks are of an acceptable level and ALARP
- Requirement to follow procedures and use risk assessments/ job hazard assessments to identify environmental impacts and risks and appropriate controls
- Requirements for interactions with other marine vessels, fishers and/or fishing equipment
- Requirements for responding to and reporting environmental hazards or incidents
- Overview of emergency response and spill management plans, and
- Reporting of fauna sightings to the MFO.

Records associated with project-specific training, environmental training and inductions will be recorded and maintained.

10.2.4. Communications

ConocoPhillips Australia's personnel (employees and contractors as appropriate) are provided with access to ConocoPhillips 'The Mark' internet and Operations Management System (OMS) and Exploration personnel are provided with access to the Otway SharePoint Site where they can access information on governance, impacts and risks, environmental performance and incident reporting and management.

The ConocoPhillips Australia HSE General Manager has responsibility for ensuring that systems are in place to facilitate the communication of HSE issues to the MODU and vessel crews. This is typically via the daily operations meeting and weekly HSE meetings.

The MODU and Vessel Masters and the Offshore Representative will be responsible for keeping offshore personnel informed about HSE issues including expectations and/or issues associated with the EP and any proposed changes to the conduct of the activity which may affect environmental performance. Meetings will include, but not limited to, offshore operations team, pre-start safety, toolbox, HSE and MFO meetings.

10.2.4.1. Internal Communications – Toolbox and HSE Meetings

Environmental matters will be raised in scheduled (daily to weekly) toolbox, operations and HSE meetings as outlined in Table 10-4. The MODU/Vessel Master, Party Chief and ConocoPhillips Australia Offshore Representative are jointly responsible for keeping the marine crews informed about HSE issues, acting as a focal point for personnel to raise issues and concerns and consulting and involving all personnel in the following:

- Issues associated with implementation of the EP
- Any proposed changes to equipment, systems or methods of operation of equipment, where these may have HSE implications, and
- Any proposals for the continuous improvement of environmental protection, including the setting of environmental objectives and training schemes.

Records associated with toolbox talks, operations and HSE meetings will be maintained.

Table 10-4: Internal communications

Meeting	Frequency	Attendees
Onshore		
ConocoPhillips project team	Daily	All team members
Offshore		
Operations (inclusive of daily cetacean strategy meeting)	Daily	ConocoPhillips onshore project team, department heads, ConocoPhillips Australia Offshore Representative, Party Chief, MMOs
Pre-start safety meeting	Daily – prior to each shift	All personnel
Toolbox	Before each task	All personnel involved in task
HSE	Weekly	All personnel

10.2.5. Ongoing Consultation with Relevant Persons

Ongoing consultation activities will build upon the consultation undertaken by ConocoPhillips Australia to date in relation to the activity. Ongoing consultation will be conducted with relevant persons identified in section 25 consultation in the preparation of the EP, relevant persons identified during the public comment period, and any other persons identified throughout the life of the project. The ConocoPhillips Australia Consultation and Communication Plan will outline a standard approach to interacting with relevant persons during the life of the activity and the process for continuing to accept and assess the merit of feedback from relevant persons or organisations and updating records in a standardised fashion during the life of the Environment Plan. Previously established preferred information channels will be used to contact and update relevant persons with new information. Any relevant new information will be assessed using the management of change process (Section 10.2.7) to ensure impacts and risks continue to be identified and managed to as low as reasonably practicable and acceptable levels. The list of all relevant persons is securely maintained on industry-leading stakeholder management software, which will be reviewed periodically to ensure that new relevant persons are consulted.

ConocoPhillips Australia will undertake activities as shown in Table 10-5 below, with additional detail on specific notification and reporting requirements provided in Section 10.5.5.

Table 10-5: Ongoing consultation, including for unplanned incidents

Activity	Tactic	Method/Channel Considered*
Provisions of updates on activity progress	• Notification of confirmation of drilling locations [Added in response to Matter: I15]. • Notification of commencement of activities. • Notification of key activity stages. • Notification of significant changes to the activity, e.g. unplanned events. • Notification of conclusion of activities.	• Email • Otway Consultation Hub • ConocoPhillips Australia Website • Social media • Signage in key ports • Notice to mariners • SMS • Telephone
External routine reporting obligations	• Pre-commencement • On completion • Performance reporting • Other notifications	• Emails • Telephone
Reportable incident notifications	• Injury or death of individual megafauna from vessel strike/entanglement • Introduction of Invasive Marine Species (IMS), and • MDO or LOWC release	• Telephone • Email
NOPSEMA	• Ongoing as required	• Telephone • Email
Emergency response organisations	• Provide with a copy of the OPEP • Engage as per OPEP	• Telephone • Email
Provision of broader information relating to ConocoPhillips Australia activities	• General activity updates as required.	• Otway Consultation Hub • ConocoPhillips Australia Website

* Not all methods/channels will be used for each relevant person.
Includes requirements identified during consultation (Org ID: 524, Wilderness Society, Event ID: 2480, FB ID: 398; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 367)

ConocoPhillips Australia is committed to continuing consultation in accordance with the objectives outlined in Table 10-6.

Table 10-6: Ongoing consultation objectives

Relevant Persons/ Group	Objectives	Preferred methods
Key commercial fishing representative bodies (AFMA, TSIC, SIV, SETFIA, Tuna Australia)	• Ensure membership is aware of location of activity and exclusion zones in place. • Ensure adjustment protocol is in place prior to activity commencing. • Continue to build relationship and channel feedback from fishers and provide a conduit to fishers during and after activity.	• Face to face meeting and/or workshops • Emails • Telephone • SMS (Org ID:11, South East Trawl Fishing Industry Association (SETFIA), Event ID: 23, FB ID: 2)

		• Signage in key ports • 48-hour look-ahead provided every 24-hours prior to and during key periods of activity (i.e. transit of rig) (Org ID: 6, Tuna Australia, Event ID: 4255, FB ID: 464; Org ID: 6, Tuna Australia, Event ID: 4526, FB ID: 473)
Commercial fishers operating in the operational area during operations	• Ensure membership is aware of location of activity and exclusion zones in place. • Ensure users are aware of start and end dates • Ensure safety requirements and logistics are clear • Ensure fishers have a clear path to apply for the adjustment package if required.	• Signage at key ports • Telephone hotline and email • Notice to mariners • Port visits and information sessions post-acceptance/pre- and during-activity if requested.
Recreational marine users	• Ensure users are aware of start and end dates • Ensure safety requirements and logistics are clear	• Signage at key ports • Information provided to representative bodies for newsletters • Telephone hotline and email • Notice to mariners • Localised social media posting, depending on drilling location
King Island residents and representative bodies	• Keep community engaged and up to date on activity	• Email • Otway Consultation Hub • ConocoPhillips Australia Website • Social media • Signage in key port locations • SMS • Telephone • Information session if requested by community, depending on drilling location

10.2.5.1. Ongoing Consultation with First Nations Peoples

ConocoPhillips Australia will continue to engage with registered native title bodies corporate, representative Aboriginal bodies and other persons or organisations identified as a relevant person in relation to First Nations cultural heritage with the objective of:

- Accommodating for new relevant persons who self-identify throughout the life cycle of the project, by providing them with sufficient information to inform management decisions on their spiritual and cultural connections to the environment that may be affected, and
- Identifying information they wish to provide on cultural features and/or heritage values.

If new cultural features and/or heritage values of places within the environment that may be affected by the activity are identified at any time, prior to or during the activity that are not described in the EP, ConocoPhillips Australia will:

- Ensure the environmental impacts and risks of the activity continue to be managed to as low as reasonably practicable and an acceptable level
- Notify NOPSEMA in writing within 7 days of these cultural features and/or heritage values of places and the potential environmental impacts and risks, and
- Submit a report to NOPSEMA no later than 14 days after the initial notification confirming:

- The control measures that have been adopted to ensure that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable and an acceptable level, and
- The consultation undertaken with any relevant persons to develop these control measures, including the control measures that those persons considered reasonably necessary to manage impacts on the cultural features and/or heritage values in accordance with Indigenous tradition and the views of the relevant persons in relation to the control measures.

10.2.6. Document Control and Records

The ConocoPhillips Australia Document Control Procedure (ABUE-000-DC-N05-C-00001) is implemented to efficiently manage key documentation, including confirming that it remains accurate, current and available to required personnel. Documents and records, including procedures, work instructions and other information necessary to carry out work activities, are retained to corporate and legislative requirements.

Documents are also periodically reviewed and revised as necessary, with current versions made available and obsolete documents removed or identified and retained (where necessary) for legal use.

In accordance with section 52 and 53of the OPGGS(E)R, documents and records relevant to the implementation of this EP are stored and maintained for a minimum of five years and, within this five year period, can be made available to regulators upon request.

Records to demonstrate implementation of the HSEMS and compliance with legislative requirements and other obligations are identified and maintained for at least five years. These records will include:

- Written reports – including risk assessment reports and registers, monitoring reports, audit and review reports – about environmental performance or implementation strategies.
- Records relating to environmental performance or the implementation strategy
- Records of environmental emissions and discharges
- Modification and changes authorised by ConocoPhillips and/or contractor
- Incident and/or near miss investigation reports
- Improvement plans (corrective actions, key performance indicators)
- Records relating to training and competency in accordance with this EP.

10.2.7. Management of Change

The intent of the Management of Change (MoC) process is to ensure that temporary and permanent changes to the organisation, personnel, systems, procedures, equipment, products, materials and/or critical assumptions (including science) are identified and managed so that impacts and risks remain ALARP and at an acceptable level.

The Management of Change Overview Procedure (ABUE-000-SF-N05-C-00002) is applied to ensure that all proposed changes are adequately defined, implemented, reviewed and documented by suitably competent persons. This process is managed using an electronic tracking database, which provides assurance that all engineering and regulatory requirements have both been considered and met before any change is operationalised.

The MoC process supports the identification of a range of changes that may occur during the life of the activity and the assessment of how these changes may affect the predictions about potential impacts, risks and cumulative impacts. Changes considered by this procedure include, but are not limited to:

- activity timing, extent and/or duration
- key plant and equipment, documented procedures and organisational systems

- regulatory requirements
- scientific knowledge, and
- the management of, or values within, areas of conservation significance such as Australian Marine Parks.

Not all changes require a MoC review. Each change is assessed on a case-by-case basis. Potential environmental impacts and risks are reviewed by a suitably competent member of ConocoPhillips Australia to determine whether the MoC review process is triggered.

As part of the MoC Overview Procedure, an activity specific addendum will be used to ensure environmental impacts and risks relevant to the exploration activity will remain at levels that are ALARP and acceptable. This addendum is considered effective because it requires:

- Periodic monitoring of relevant publications for relevant literature.
- Consideration of the inherent and residual environmental impacts and risks
- Validation of the context and scope of the impact or risk assessment
- Validation of the predicted impact levels and the define acceptable levels
- Reassessment of the effectiveness of control measures against the specified performance standards
- Adoption of additional, alternative, or improved control measures that are identified to be reasonably practicable
- Reassessment of any environmental trade-offs or unintended consequence of the change, and
- Engagement with external experts for environmental matters where there is low levels of confidence in the prediction of impacts/risks.

In accordance with section 26(3)(4)(5) of the Environment Regulations (2023), ConocoPhillips Australia will undertake a review of the EP to ensure changes in legislation, science (and associated changes to impact and risk assessments), consultation or other management requirements are accounted for and assessed on a regular basis to maintain an acceptable level/ALARP, at least one month prior to commencement of the activity. If an identified change triggers an MoC, the standard process will involve:

- Initiation
- Review or Assessment (as applicable)
- Approval
- Implementation
- Close-out
- Communication

The MoC request process will be periodically checked against NOPSEMA guidance to ensure ongoing compliance and will be undertaken as part of the review process described in Section 10.5.7 Review and Adjust.

Following a MoC process where new information is considered for the EP, relevant persons who may be affected by the change will be provided with summaries of the research and changes to the activity or control measures.

10.3. Environment Functional Area (DO)

ConocoPhillips Australia utilises a range of procedures and plans to manage environmental impacts and risks and ensure EP and regulatory requirements are met. These include joint risk reviews, inductions and compliance instructions to ensure contractors manage impacts and risks in accordance with the control measures identified in the EP for the following, as applicable:

- Releases: Waste, process water, chemical or hydrocarbon discharges; spills or leaks to water
- Emissions: Air, light and noise emissions
- Waste: Handling and disposal of waste
- Water: Storage and treatment for reuse or recycling and discharge or disposal
- Other: Potential impacts from operations to wildlife, including threatened and migratory species and fisheries

In addition, ConocoPhillips Australia has:

- Conducted an environmental hazard identification (ENVID) and preliminary environmental impact and risk assessment, based on existing environment and activity description, and
- Has considered industry best practices for exploration activities to eliminate or minimise environmental impacts and risks to achieve acceptable levels and ALARP.

10.3.1. Light Management Plan

ConocoPhillips Australia will develop and implement a Light Management Plan as per the National Light Pollution Guidelines for Wildlife (CoA 2023) for the activity. Once safety navigational lighting requirements are met (as per vessel class), the Light Management Plan will detail additional mitigations to ensure artificial lighting is reduced to minimum levels based on the information in the Seabird Light Mitigation Toolbox (CoA 2023), wherever practicable, whilst maintaining safe working conditions and navigation.

Specifically:

- Outwards facing lighting will be reduced to minimum levels, wherever practicable.
- Directions to minimise non-essential lights (e.g. close blinds, turn lights off when leaving a room etc.) during sensitive timing (e.g. OBP migration season) will be included in the MODU and vessel inductions and periodic toolbox meetings.
- A program for handling /rescuing grounded birds will be designed and implemented, and crew will be instructed to remain vigilant for seabird collisions
- Any observed/ discovered incidents will be recorded and reported within the environmental performance report.

10.3.2. Fauna Management Plan

ConocoPhillips Australia has developed and will implement a Fauna Management Plan (FMP) to ensure that impacts to marine mammals are reduced to ALARP and acceptable levels (Appendix N). This Plan will be implemented to ensure environmental performance outcomes for marine mammals can be achieved including:

- No death or injury to listed threatened or migratory species, from the activity.
- Biologically important behaviours can continue while the activity is being undertaken.
- Anthropogenic noise in biologically important areas will be managed such that:
    - Any blue whale continues to utilise the area without injury, and is not displaced from a foraging area, and
    - It does not prevent any southern right whale from utilising the area or cause injury (TTS and PTS) and/or disturbance.

Requirements for record keeping and reporting are detailed in the Fauna Management Plan.

10.3.3. Invasive Marine Species

ConocoPhillips Australia's Marine Assurance process, including an Invasive Marine Species (IMS) Risk Assessment, will be conducted for the MODU, vessels and submersible equipment, prior to initial mobilisation into the operational area.

The purpose of this process is to:

- Validate compliance with regulatory biosecurity requirements (Commonwealth and State)
- Quantify the potential IMS risk profile of MODU, vessels and submersible equipment
- Identify potential deficiencies of IMS controls
- Identify additional controls to be implemented prior to deployment to the operational area to manage IMS risk, and
- Prevent the translocation and potential establishment of IMS into non-affected environments (either to or from the operational area).

The risk assessment is conducted by a qualified IMS inspector prior to initial mobilisation to the operational area. The IMS risk assessment process evaluates:

- Compliance with relevant IMO and regulatory requirements under the Commonwealth Biosecurity Act 2015 and/or relevant Australian State or Territory legislation
- Age, type and condition of the vessel/immersible equipment and history since previous inspection.
- Previous cleaning and inspection undertaken and the outcomes of previous inspections
- Assessment of internal niches with potential to harbour IMS
- Origin of the MODU/vessel/equipment including potential for exposure to IMS
- Translocation risk based upon source location in relation to activity location – both in relation to the water depth/proximity to land at the point of origin and the potential survivorship of IMS from the point of origin to the operational area
- Mobilisation method – whether dry or in-water (including duration of low-speed transit through high or uncertain risk areas)
- The application, age and condition of antifouling coatings on vessels
- The presence and condition of internal biofouling control treatment systems for key internal seawater systems
- The Biofouling Management Plan and record book, and
- The Ballast Water Management Plan and record book.

Where the MODU, vessel or submersible equipment have been deemed low risk by the IMS inspector, no further management measures are required, and the MODU, vessel or equipment may be deployed into the operational area.

Based on the outcomes of each IMS Risk Assessment, management measures commensurate with the risk will be implemented to minimise the likelihood of new IMS being introduced, or established IMS being spread within Australian waters.

Any potential IMS material observed during the pre-mobilisation inspections, or the exploration drilling program will be reported to DAFF and treated as per DAFF instructions.

10.3.4. General and Hazardous Chemical Management Procedures

ConocoPhillips Australia's Chemical Management Procedures include requirements for the assessment of the impacts and risks associated with chemicals that could be discharged to the marine environment during offshore activities. This assessment aims to ensure that the impacts and risks associated with offshore discharges are environmentally acceptable by national and international standards (including the World Bank (2015) Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development), and are reduced to ALARP. The assessment considers aquatic toxicity, bioaccumulation and persistence data, along with discharge concentration, duration, frequency, rate, and volume for chemicals that will, or may, be discharged to the marine environment. Contractors will be required to demonstrate that their chemical selection process aligns with these requirements, as a minimum.

All chemicals used in discharged streams will be rated Gold/Silver/D or E through Oslo and Paris Conventions (OSPAR) and Offshore Chemical Notification Scheme (OCNS), or have a complete risk assessment. The OSPAR commission has identified substances considered to pose little or no risk (PLONOR) to the environment based on their toxicity, biodegradation and potential to bioaccumulate.

10.4. Crisis Management and Emergency Response

Section 22(8) of the Environment Regulations 2023 requires the implementation strategy to contain an OPEP and the provision for the OPEP to be updated. The OPEP is designed to be an operational document. As such, some of the content requirements of the regulations are included in this EP. A summary of the regulatory requirements and a reference to where the obligations are met is provided below.

The OPEP (including an overview of the OSMP) is provided in Appendix I. In accordance with section 22(9), the OPEP must include arrangements to respond to and monitor oil pollution, including:

- Control measures necessary for a timely response to an oil pollution emergency
- Arrangements and response capability to implement a timely implementation of those controls, including ongoing maintenance of that capability
- Arrangements and capability for monitoring the effectiveness of the controls and ensuring that performance standards for those controls are met
- Arrangements and capability for monitoring oil pollution to inform response activities refer to OPEP in Appendix I, and
- Provision for the OPEP to be updated.

10.4.1. Arrangements and Capability

During the response to an incident, ConocoPhillips Australia has adopted the P.E.A.R.L principle to guide prioritisation of the response:

P - People (health and safety of responders, workers and public)
E - Environment
A - Assets
R - Reputation of the company
L - Liability

Preparedness also includes ensuring that there are competent personnel available to respond to and manage emergency events and that their competence is maintained through regular training. ConocoPhillips Australia achieves this through its adoption of competency-based training and annual 'crisis and emergency' exercise plans. ConocoPhillips Australia:

- Conducts reviews of plans and supporting documents annually
- Trains employees on their responsibilities and duties and documents required training types and frequencies
- Conducts exercises and drills per the ABU schedule and risk assessment to test the effectiveness of the plan
- Documents and tracks identified action items to completion.
- Has identified and equipped an Incident Command Post (ICPs) and primary and alternate Emergency Operations Centres (EOCs) to support emergency response plans and has also established a Virtual Incident Command Posts (VICPs).

All reasonably foreseeable crisis and emergency situations are identified via appropriate systematic review and analysis processes, with results documented in crisis and emergency management processes and systems.

ConocoPhillips Australia is supported by a corporate Crisis Management and Emergency Response (CMER) Plan. Corporate CMER is responsible for maintaining, coordinating and implementing:

- Training
- Drills and Exercises
- EOC readiness
- Tier 2/3 emergency response support

Corporate CMER also manage corporate response teams, including: the Crisis Management Team (CMT), Crisis Management Support Team and Global Incident Management Assist Team and will maintain designated primary and secondary EOCs.

10.4.2. Emergency Response Framework

The ConocoPhillips Australia crisis and emergency management arrangements uses a graduated tiered response framework which classifies incidents based on the significance of the consequences, the risks involved and potential for escalation. There are three integrated elements in this structure framework, which combine to effectively manage crisis events and emergencies at ConocoPhillips facilities and business operations.

ConocoPhillips maintains a trained and ready incident management team (IMT) and crisis management team (CMT) to execute the emergency response plans (ERPs) and crisis management plans. The IMT provides operational management support, and the CMT provides strategic direction with respect to management of reputational damage and impacts to business continuity.

ConocoPhillips utilises he Incident Command System (ICS), one of the leading response systems employed worldwide. ICS can be readily applied to a range of response situations and organisational emergency management structures.

The IMT and CMT will utilise the ConocoPhillips Crisis and Incident Management Plan to guide response to an event. The IMT and CMT are structured so that, during an emergency event, rotations are managed to avoid fatigue and maintain staff health and well-being. For the Otway Exploration Drilling Program, the emergency response team (ERT) responsibilities and initial response processes will be managed via the drilling rig contractor ERT; which feed information through to the ConocoPhillips IMT, via the Master and ConocoPhillips Offshore Representative. The contractor may also stand up its own IMT.

There are ERPs for all offshore work platforms that are carried out by an ERT. The ERT will be coordinated by the relevant person in charge (Party Chief, MODU Master or Vessel Master) to ensure that there is adequate emergency service cover on board at all times. The Party Chief or Master will be the point of contact between assets within the permit area and the ConocoPhillips IMT. The ConocoPhillips IMT leader is the point of contact between the ConocoPhillips IMT and the CMT. Contractors are required to notify the ConocoPhillips Offshore representative of any emergency. The emergency response structure is detailed in the OPEP.

10.4.3. Offshore Spill Response Training

Quarterly training of MODU/vessel crew in their Ship Oil Pollution Emergency Plan (SOPEP) is a MARPOL requirement for vessels >400 gross tonnes (Annex 1, Regulation 37). During contractor selection, ConocoPhillips Australia will ensure that the chosen contractor has been implementing this requirement.

SOPEPs typically include vessel-specific procedures for managing pollution emergencies resulting from incidents such as hull damage from a collision or grounding. The SOPEP includes information about initial response, reporting requirements and arrangements for the involvement of third parties having the appropriate skills and facilities to effectively respond to oil spill issues.

The SOPEP will be the principal working document for the vessel and crew in the event of a spill. The SOPEP describes specific emergency procedures including steps to control discharges for bunkering spills, hull damage, grounding and stranding, fire and explosion, collisions, vessel list, tank failure, sinking and vapour releases. The SOPEP also includes requirements for regular emergency response drills of the plan and revisions following drills or incidents.

10.4.4. Testing of Spill Response Arrangements

In accordance with section 22 (14)(a)(b)(c)(of the Environment Regulations (2023), emergency response arrangements for the activity are tested:

- When they are introduced
- When they are significantly amended
- Not later than 12 months after the most recent test.

Prior to commencing the activity, ConocoPhillips Australia's' spill response arrangements will be tested and have been incorporated into the relevant annual drill schedules (culminating in a Tier 3 drill exercise to confirm preparedness for this activity).

Actions and lessons arising from testing the OPEP will be tracked to completion within a timeframe relevant to the activity to ensure spill response preparedness. An emergency response drill/exercise schedule has been developed to test and continually improve preparedness in support of the exploration program, in accordance with ConocoPhillips Australia Crisis and Incident Management Plan.

10.4.5. Adverse Weather Protocols

During drilling activities it is the duty of the MODU Master to act as the focal point for all actions and communications with regards to any emergency, including response to adverse weather or sea state, to safeguard the rig, the support vessels, all personnel onboard and the environment. For seabed survey activities it is the duty of the vessel master to assure the above.

During adverse weather, the relevant Master (Rig/Vessel) is responsible for the following:

- Ensuring the safety of all personnel onboard
- Monitor all available weather forecasts and predictions
- Initiating the safety management system, HSE procedures and/or ERP
- Keeping the Party Chief and ConocoPhillips Australia Offshore Representative fully informed of the prevailing situation and intended action to be taken
- Assessing and maintaining security, watertight integrity and stability of the rig/vessel
- Evacuating and/or proceeding to identified shelter location(s) as appropriate.

Other appropriate responsibilities shall be taken into consideration as dictated by the situation.

10.4.6. Operational and Scientific Monitoring

Operational and scientific monitoring arrangements are required to be in place in the event of a hydrocarbon spill during the activity and are described in the OPEP. A detailed operational and scientific monitoring program, specific to exploration activities, will:

- Identify high priority protection areas within the environment that may be affected
- Specify monitoring methodologies
- Detail processes to determine the monitoring studies that will be implemented in order to:
- Provide situational awareness and assist in planning and execution of spill response to minimise environmental harm, and
- Provide for short-term and long-term environmental impact and recovery assessments.

10.5. Continuous Improvement (ASSESS & ADJUST)

This section of the implementation strategy provides for monitoring, recording, auditing, management of non-conformance and review of environmental performance to ensure that EPOs, control measures and EPS in the EP are being met. Monitoring implementation and the effectiveness of control measures and EPS throughout the activity, will ensure they remain effective in achieving the EPOs and non-compliances or opportunities for improvement are appropriately identified and addressed.

10.5.1. Investigations, Learning and Corrective Actions

All non-conformances, incidents and near misses must be reported and investigated commensurate with associated risk, to ensure that preventative and corrective actions are identified and tracked to closure.

Incident investigations will be documented using the seabed survey and drilling rig contractor's incident management databases to track actions and enable sharing of learnings. ConocoPhillips Australia will be informed of all incidents and maintain its own database.

Non-conformances may be identified through audits, observations or incident reports. Actions to address non-conformances are developed following the same process applied to address root causes of incidents.

10.5.2. Incident Management

Incidents will be managed in accordance with the ConocoPhillips Australia Incident Reporting and Investigation Procedure, which includes Incident Reporting for Offshore Petroleum Activities. This process outlines reporting requirements for operators and titleholders as follows:

- Operators of facilities (dutyholders) undertaking work for ConocoPhillips Australia have a duty to notify and report accidents and dangerous occurrences which occur at or near facilities to NOPSEMA under Clause 82 of Schedule 3 to the OPGGS Act 2006.
- The titleholder (dutyholder) has a legal obligation under the OPGGS (Resource Management and Administration) Regulations 2011 (OPGGS(RMA) Regulation) to report well-related incidents to NOPSEMA within a specified period of time, and
- The titleholder (dutyholder) has a legal obligation under OPGGS(E) Regulation to report environmental incidents to NOPSEMA within a specified period of time, depending on the impact or potential impact to the environment.

An overview of the reporting requirements for recordable and reportable environmental incidents is provided in the following sections.

10.5.2.1. Recordable Incidents

Section 5 of the Environment Regulations defines a 'recordable' incident as a breach of an EPO or EPS in the EP that applies to the activity that is not a reportable incident.

Routine monthly recordable incident reports, including 'nil' incident reports, will be prepared by ConocoPhillips Australia's HSE General Manager and submitted to NOPSEMA by the 15th of each month. These are reported using the NOPSEMA template Monthly environmental incident reports (N-03000-FM0928). Table 10-7 summarises the recordable incident reporting requirements.

Table 10-7: Recordable incident reporting requirements

Timing	Reporting requirements	Contact
By the 15th of each month	All recordable incidents that occurred during the previous calendar month. The date of the incident. All material facts and circumstances concerning the incidents that the operator knows or is able to reasonably find out. The EPO and/or EPS breached. Actions taken to avoid or mitigate any adverse environmental impacts of the incident. Corrective actions taken, or proposed to be taken, to stop, control or remedy the incident. Actions taken, or proposed to be taken, to prevent a similar incident occurring in the future. Actions taken, or proposed, to prevent a similar incident occurring in the future.	NOPSEMA – submissions@ nopsema.gov.au

10.5.2.2. Reportable Incidents

Section 5 of the OPGGS(E) defines a 'reportable' incident as an incident that has caused, or has the potential to cause, moderate to significant environmental damage.

In the context of the Risk Matrix Standard, ConocoPhillips defines 'moderate to significant environmental damage' to be hazards identified through the impact and risk assessment process as having a consequence of 'Moderate (3)' or greater. Impacts and risks with these ratings (as detailed in Sections 6 and 7) include:

- Injury or death of listed threatened or migratory species from the activity
- Introduction, establishment or spread of Invasive Marine Species (IMS) attributable to the activity, and
- A marine diesel oil release, and
- A loss of well control event.

Table 10-8 presents the reportable incident reporting requirements.

Table 10-8: Reportable incident reporting requirements

Timing	Requirements	Contact
Verbal notification		
Within 2 hours of becoming aware of incident	The verbal incident report must include: • All material facts and circumstances concerning the incident that the titleholder knows, or is able, by reasonable search or enquiry, to find out • Any actions taken to avoid or mitigate any adverse environmental impacts of the reportable incident; and • The corrective action that have been taken, or are proposed to be taken, to stop, control or remedy the reportable incident.	NOPSEMA – 1300 674 472 NOPSEMA – submissions@nopsema.gov.au NOPTA – reporting@nopta.gov.au
	Specifically, for a Level 1, 2 or 3 spill, as above. The DNP are required to be notified of unplanned events such as an oil spill which occurs within an AMP, or is likely to affect any AMP. The notification should include: • titleholder details • time and location of the incident • proposed response arrangements and locations as per the OPEP (e.g. dispersant, containment, etc.) • contact details for the response.	Refer to OPEP Director of National Parks – 0419 293 465 (24hr Marine Park Compliance Duty Officer) * The DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident.

Timing	Requirements	Contact
	(Org ID: 7, Director of National Parks (DNP), Event ID: 2470, FB ID: 247)	
	Oiled wildlife	DEECA – 1300 134 444 (24 hours) NRE-Tas – 03 6165 4503
	Suspected or confirmed IMS introduction, with notifications to include photos of suspected IMS. The South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (Director of National Parks 2013) identifies IMS, and diseases translocated by shipping, fishing vessels and other vessels as a threat to the AMP network.	DCCEEW – 1800 900 090 (general enquiries), or directly to a biosecurity officer on 1800 798 636. Director of National Parks – 0419 293 465 (24hr Marine Compliance Officer)
	Injury or death of EPBC Act-listed fauna (e.g., vessel collision)	Whale and dolphin emergency hotline – 1300 136 017 Seals, Penguins or Marine Turtles – 136 186 (Mon-Fri 8am to 6pm) AGL Marine Response Unit 1300 245 678. NRE Tasmania 0427 942 537 (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 47)
Written notification		
Not later than 3 days after the first occurrence of the incident	A written incident report must include: • All material facts and circumstances concerning the incident that the titleholder knows, or is able, by reasonable search or enquiry, to find out; • Any actions taken to avoid or mitigate any adverse environmental impacts of the reportable incident; • The corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident; and • The action that has been taken, or is proposed to be taken, to prevent similar recordable incidents occurring in the future.	NOPSEMA – submissions@nopsema.gov.au
Within 72 hours of the incident	As above, with regard to details of a vessel strike incident with a cetacean	Upload information to online National Ship Strike Database (https://data.marinemammals.gov.au/report/shipstrike)
Within 7 days of the incident	As above, with regard to impacts to MNES, specifically injury to or death of EPBC Act-listed species	EPBC.Permits@dcceew.gov.au DCCEEW 1800 920 528
Within three days of becoming aware of the event	Significant impact to MNES (as classified using the ConocoPhillips Risk Matrix)	EPBC.Permits@dcceew.gov.au DCCEEW 1800 920 528 Director of National Parks written Notification: marineparks@environment.gov.au; marine.compliance@environment.gov.au
Within 7 days of providing written report to NOPSEMA	As above.	NOPTA – reporting@nopta.gov.au
Within 2 days	Suspected or confirmed IMS introduction or observation, with notifications to include photos of suspected IMS, and provided no later than 24 hours following detection.	Agriculture VIC – marine.pests@agriculturevic.gov.au; and Biosecurity TAS – biosecurity.tasmania@nre.tas.gov.au

Timing	Requirements	Contact
Within 7 days of identification	Identification of any historic shipwreck, aircraft, UXO or other cultural relics	Discovery of any item of underwater cultural heritage is to be recorded in the AUCHD: Notification of discovery of underwater cultural heritage: SHIPWRECKS - Notification of discovery of an in-situ Historic Shipwreck or Relic (environment.gov.au) The Tasmanian State Practitioner will evaluate items found within T/49P. (GPO Box 1751 Hobart Tas 7001 Tel: 1300 8277 27) The Victorian State Practitioner will evaluate items found within VICP/79. (heritage.victoria@delwp.vic.gov.au)

Reporting requirements for vessel strikes with cetaceans were relocated from Table 7-8 to the Implementation Strategy (Table 10-8), in response to consultation feedback (Org ID: 524, Wilderness Society, Event ID: 2480, FB ID: 397; Org ID: 111, Australian Marine Conservation Society, Event ID: 3785, FB ID: 366).

Following submission of the above, NOPSEMA may, by notice in writing, request ConocoPhillips Australia to submit an additional report(s) of the incident. Where this is the case, NOPSEMA will identify the information to be contained in the report(s) or the matters to be addressed and will specify the submission date for the report(s). ConocoPhillips Australia will prepare and submit the report(s) in accordance with the notice given.

10.5.3. Incident Investigation

Any non-compliance with the EPS' outlined in this EP will be investigated and follow-up action will be assigned as appropriate.

The findings and recommendations of inspections, audits and investigations will be documented and distributed to relevant rig, vessel and project personnel for review. Tracking the close-out actions arising from investigations is managed via the ConocoPhillips Australia and contractor's incident management systems.

Investigation outcomes will be communicated to the project team via daily operations meetings and to the rig and vessel crews during daily toolbox meetings and at weekly HSE meetings.

Lessons learned in the investigation report will be incorporated into shared across ConocoPhillips Australia to reduce the likelihood of reoccurrences.

10.5.4. Measuring and Monitoring

Measuring and monitoring of environmental performance provides assurance of compliance, assesses the effectiveness in meeting EPOs and legal obligations, and identifies opportunities for improvement.

10.5.4.1. Records of Emissions and Discharges

ConocoPhillips Australia will maintain a quantitative record of emissions and discharges for the activity as required under Section 22(6) of the OPGGS(E) Regulations (2023). This includes emissions and discharges to air and water (from both planned and unplanned activities). Results are reported annually and, in the end,-of-activity performance reports submitted to NOPSEMA.

A summary of the environmental monitoring to be undertaken for the activity is presented in Table 10-9. Note: general and hazardous waste streams generated during the activity are backloaded to port for disposal to a licenced waste facility, and are not within the scope of the EP.

Table 10-9: Summary of environmental monitoring

Aspect	Monitoring parameter	Frequency	Record
Underwater sound	Megafauna visual observations: Species, number, behaviour and any actions taken	Continuous bridge watch during activity	Daily reports End-of-activity report Incident report (if required)
	VSP source volume	Throughout VSP	Logs
Light emissions	Minimisation of unnecessary lighting	Pre-mobilisation Continuous during activity	Marine assurance inspections Induction records HSE meeting topics Bridge logs
Atmospheric emissions	Bunkering Fuel consumption	Tallied annually and at end of activity	Daily reports and/or bunker receipts
	ODS discharges	Tallied annually and at end of activity	ODS record book confirms no deliberate release of ODS
Discharges (Org ID: 13, King Island Marine Research, Event ID: 574, FB ID: 223)	Volume of bilge water discharged	Each discharge (infrequent)	Oil record book
	Volume and quality of sewage and greywater discharge	As per ISPP certificate	Maintenance records of sewage treatment system
Hazardous and non-hazardous materials management	Solid waste generation	Pre-mobilisation Continuous during activity	Garbage record book Safety data sheets Approved chemical register Waste transfer certificates for onshore transfers Incident report
Displacement of or interaction with third-party vessels	Ongoing patrol for, and communications with, third-party vessels by support vessels. Radar surveillance from MODU.	Continuous during activity	Bridge communications book
Introduction of IMS	Biofouling risk	Pre-mobilisation Continuous during activity	IMS Report Biofouling Record Book Incident report
	Volume and location of ballast water discharges	Each discharge	Ballast water log
Vessel strike with cetaceans	Megafauna visual observations	Continuous bridge watch during activity	Incident report
MDO spill / LOWC event	Operational and scientific monitoring in line with the OPEP and OSMP (depending on volume)	As required	Incident report

10.5.5. Notifications and Reporting

Table 10-10 outlines ConocoPhillips Australia's routine notification and reporting obligations with external organisations, including the submission of environmental performance reports for the activity to NOPSEMA, at specified intervals. These will be updated and maintained in the Marine and Coastal Users Consultation and Communication Plan developed for the activity.

Table 10-10: Summary of routine reporting and notification requirements

Requirement	Timing	Contact Details	OPGGS(E) Regulation Section
Pre-commencement			
Notify AMSA's Rescue Centre (ARC) in order to issue daily AusCoast warnings. Provide vessel details (including name, callsign and Maritime Mobile Service Identity (MMSI)), satellite communications details (including INMARSAT-C and satellite telephone), area of operation, requested clearance from other vessels and advise when operations start and end (Org ID: 8, Australian Maritime Safety Authority (AMSA), Event ID: 484, FB ID: 9).	Within 24 - 48 hours of activity starting	rccaus@amsa.gov.au 1800 641 792 +61 2 6230 6811	25
Notify NOPSEMA with the activity commencement date.	At least 10 days prior to activity commencement	submissions@nopsema.gov.au	54
Notify the Director of National Parks prior to conducting a mining operation activity within an AMP (condition 1, mining class approvals).	The timeframe for notification will be agreed to by the DNP and the titleholder during relevant person consultation. It would generally be sought at least 10 days prior to entering an AMP.	Director of National Parks – 0419 293 465 (24hr Marine Park Compliance Duty Officer)	25
Notify other relevant persons advising of EP acceptance and provide update on activity timing and adjustment protocol for fishers.	Within 10 business days of acceptance	Via Consultation Manager Database	25
Provision of OPEP to AMSA, DTP and TasEPA following EP acceptance and prior to commencement.	Prior to commencement of activity	Via Consultation Manager Database	25
Notify the AHO of the activity commencement date and duration to enable Notices to Mariners to be issued. (Org ID: 28, Department of Defence, Event ID: 540, FB ID: 159)	Four weeks prior to activity starting.	datacentre@hydro.gov.au, 02 4223 6500	25
Activity Completion			
Notify AMSA in order to cease daily AusCoast warnings.	Within 24 hours of activity completion	rccaus@amsa.gov.au 1800 641 792 +61 2 6230 6811	25
Notify relevant persons	Within 2 days of activity completion	Via Consultation Manager Database	25
Notify the AHO in order to cease the issuing of Notices to Mariners.	Within 2 days of activity completion	datacentre@hydro.gov.au, 02 4223 6500	25
Notify NOPSEMA of the activity end date.	Within 10 days of activity completion	submissions@nopsema.gov.au	54
Notify NOPSEMA of the end of the operation of the EP	After acceptance of the end-of-activity EP Performance Report.	submissions@nopsema.gov.au	46
Performance Reporting			

Submit annual EP Performance Reports.	Within 3 months of annual commencement date for activity, for ongoing activities	submissions@nopsema.gov.au	22, 51
Submit an end-of-activity EP Performance Report.	Within 3 months of activity completion	submissions@nopsema.gov.au	22
Observations of marine fauna within the T/49P operational area	At the end of the activity, or on an annual basis where the activity spans a number of years. Including ID to species where possible, location-GPS (grid reference GDA94), observer name, date, number of individuals and area occupied.	policyteamnre@nre.tas.gov.au (Org ID: 14, Department of Natural Resources and Environment Tasmania (NRE TAS), Event ID: 4145, FB ID: 47)	
Incidents involving birds within relevant operational areas. [Added in response to Matter: B18].	At the end of the activity, or on an annual basis where the activity spans a number of years. Including ID to species where possible, location-GPS (grid reference GDA94), observer name, date, number of individuals.	NRE Tasmania: policyteamnre@nre.tas.gov.au DEECA Victoria: 136 186	
Other - Cultural Heritage			
Notify NOPSEMA of any new cultural features and/or heritage values of places identified within the environment that may be affected by the activity, and potential environmental impacts and risks.	Within 7 days of identification	NOPSEMA – submissions@nopsema.gov.au	
Submit a report to NOPSEMA confirming: •The control measures that have been adopted to ensure that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable and an acceptable level, and •The consultation undertaken with any relevant persons to develop these control measures, including the control measures that those persons considered reasonably necessary to manage impacts on the cultural features and/or heritage values in accordance with Indigenous tradition and the views of the relevant persons in relation to the control measures.	Within 14 days of initial notification	NOPSEMA – submissions@nopsema.gov.au	

10.5.6. Audits and Inspections

An audit and inspection program will be developed and implemented in accordance with the ConocoPhillips Corporate Audit Standard and the ConocoPhillips Australia HSEMS. Post acceptance of the EP, conformance will be monitored on an at least quarterly basis, as well as through commitments under MoC process.

During the activity, environmental performance will be monitored on an at least fortnightly basis by the ConocoPhillips Offshore Representative, or delegate, via audits and inspections to confirm:

- Regulatory requirements detailed in the EP are being met
- Environmental performance standards and control measures, to achieve the EPOs, are being implemented and reviewed for effectiveness
- Potential non-conformances and opportunities for continuous improvement are being identified, and
- Environmental monitoring and reporting requirements are being met, including the tracking of emissions and discharges.

Unscheduled audits may also be initiated by ConocoPhillips Australia in the event of an incident, non-compliance or for other valid reasons.

Table 10-11 describes the levels of inspections and audits that will be undertaken for the Otway Exploration Drilling Program.

The Environmental Performance Outcomes, Standards and Measurement Criteria (Section 9) captures all of the compliance requirements for the EP and will be transitioned into a compliance tracking tool on acceptance of the EP.

EP compliance requirements will be distributed onboard the MODU and vessels (including role-specific checklists), and implementation of EPS will be monitored by the ConocoPhillips Offshore Representative and verified by the ConocoPhillips HSE General Manager (or delegate) through review of the completed checklists and attendance at relevant meetings.

Any non-conformances or opportunities for improvement identified at the time of an inspection or audit will be communicated to the relevant ConocoPhillips and contractor personnel at the time of the inspection and summarised in a report. These are tracked in an incident management system, which includes assigning responsibilities to personnel to manage the issue and verify that it is closed out.

Non-compliances and/or opportunities for improvement will be communicated to personnel in writing and at appropriate meetings.

Table 10-11: Summary of environmental inspections and audits

Type	When	Frequency	Work Platforms	Method	Details
HSE due diligence inspection	Post-award, pre-SPUD	Once	Survey vessels, MODU and support vessels	Desktop or in port/during mobilisation	Inspections will be undertaken to ensure that the environmental performance outcomes and standards documented in this EP can be achieved. The inspections will be conducted prior to mobilisation.
Ongoing inspections	During activity	Weekly	Survey vessels, MODU and support vessels	In person on board	Checklists provided by ConocoPhillips to be completed by: • MODU – ConocoPhillips Australia Offshore Representative • Survey and Support vessels – Vessel Master. Inspection will include, but not be limited to: • Spill preparedness • Waste management • Validation all EPOs and EPS are maintained as per Section 9 • Compliance with procedural controls relevant to environmental management of the activity.

10.5.6.1. Regulatory Inspections

Under Part 5 of the OPGGS Act, NOPSEMA inspectors have the authority to enter ConocoPhillips Australia premises, including survey vessels, the MODU and support vessels, to undertake monitoring or investigation against this EP. ConocoPhillips Australia will cooperate fully with the regulator if such investigations take place.

10.5.7. Review and Adjust

Through a process of adaptive management, lessons from management outcomes will be used for continual improvement. Formal reviews of the effectiveness and appropriateness of the management system are performed by senior management on a periodic basis. The things learned from this process and iterative decision-making will then be used as feedback to improve ongoing management.

10.5.7.1. EP Review

ConocoPhillips may determine that an internal review of the EP (including the OPEP and OSMP) may be necessary based on any one or all of the following factors:

- Changes to hazards and/or controls identified in the review of the EP, which is supported by:
- Reviewing changes to Australian Marine Park (AMP) management arrangements (through subscription to the AMP email update service at https://parksaustralia.gov.au/marine/about/
- Environment and industry legislative updates (through subscriptions to NOPSEMA, APPEA and legal firms).
- Running a new EPBC Act Protected Matters Search Tool (PMST) search for the LOWC EMBA immediately prior to the activity to determine whether there are newly-listed threatened species or ecological communities.
- Remaining up to date with new scientific research that may impact on the environmental impact and risk assessments in the EP (for example, through professional networking, APPEA membership and engagement with stakeholders), and
- Remaining in regular contact with stakeholders.
- Implementation of corrective actions to address internal or external inspection or audit findings
- An environmental incident and subsequent investigation identifies issues in the EP that require review and/or updating
- A modification of the activity is proposed that is not significant but needs to be documented in the EP
- Changes identified through the MoC process, such as hazards or controls, organisational changes affecting personnel in safety critical roles or HSE management systems, and
- Changes to relevant legislation or other requirements.

The HSE team provides advice to the ConocoPhillips Australia Exploration Manager on the material impact of the items listed previously and whether or not a review of the EP should be undertaken. The scope of a review is determined by the factors that trigger the review and an appropriate team will be assembled by the HSE General Manager to conduct the review. The team may consist of representatives from the Government and External Affairs, Engineering, HSE, Operations or Supply Chain teams as required by the scope.

If a review of the EP relates to a topic that had previously been raised by a stakeholder, an updated response to affected stakeholders will be prepared and provided to affected stakeholders in a process managed by the Government and External Affairs Manager.

The MoC process described in Section 10.2.7 will apply.

10.5.7.2. Revisions Triggering EP Resubmission

ConocoPhillips Australia will revise and re-submit the EP for assessment as required by the OPGGS(E) Regulation listed in Table 10-12.

Table 10-12: EP revision requirements

Regulations	OPGGS(E) Regulation Section
Submission of a revised EP before the commencement of a new activity.	38
Submission of a revised EP when any significant modification or new stage of the activity that is not provided for in the EP is proposed.	39(1)
Submission of a revised EP before, or as soon as practicable after, the occurrence of any significant new or significant increase in environmental impact or risk not provided for in the EP.	39(2)

Submission of a revised EP if a change in titleholder will result in a change in the manner in which the environmental impacts and risks of an activity are managed.	39(3)

Revisions and re-submission of the EP generally centre around ‘new’ activities, impacts or risks and ‘increased’ or ‘significant’ impacts and risks. ConocoPhillips Australia defines these terms in the following manner:

- **New impact or risk** – one that has not been assessed in Section 6 or 7.
- **Increased impact or risk** – one with greater extent, severity, duration or uncertainty than is detailed in Section 6 or 7.

A significant change means:

- The change to the activity design deviates from the EP to the degree that it results in new activities that are not intrinsic to the existing Activity Description in Section 2.
- The change affects the ability to achieve ALARP or acceptability for the existing impacts and risks described in Section 6 or 7.
- The change affects the ability to achieve the EPOs and EPS contained in Sections 6, 7 or 9.

A change in the activities, knowledge, or requirements applicable to the activity are considered to result in a ‘significant new’ or ‘significant increased’ impact or risk if any of the following criteria apply:

- The change results in the identification of a new impact or risk and the assessed level of risk is not ‘Low’, acceptable and ALARP.
- The change results in an increase to the assessed impact consequence or risk rating for an existing impact or risk described in Section 6 or 7; and
- There is both scientific uncertainty and the potential for significant or irreversible environmental damage associated with the change.

While an EP revision is being assessed by NOPSEMA, any activities addressed under the existing accepted EP are authorised to continue. Additional guidance is provided in NOPSEMA’s Guideline *When to submit a proposed revision of an EP* (N04750-GL1705, Rev 1, January 2017).

10.5.7.3. Minor EP Revisions

Minor revisions to this EP that do not require resubmission to NOPSEMA will be made where:

- Minor administrative changes are identified that do not impact on the environment (e.g. document references or contact details).
- A review of the activity and the environmental impacts and risks of the activity do not trigger a requirement for a revision, as outlined in Table 10-12.
- An improvement in the level of environmental performance.

11. Units

Unit	Description
°C	Degrees Celsius
µg/kg	Microgram per kilogram
µm	Micrometre
bbl	Barrel of crude oil
cm	Centimetre
cP	Constant pressure
dB	Decibel
dB re 1 µPa	dB referenced to a pressure of 1 microPascal (µPa)

dB re 1 µPa2.s	dB level of the time-integrated, squared sound pressure normalised to a one second period
DDM	Degrees Decimal Minutes
e-CO_2	Atmospheric emissions
g/m^3	Gram per cubic metre
g/m^2	Gram per square metre
ha	Hectare
kg	Kilogram
kg/m^3	Kilogram per cubic metre
kg/day	Kilogram per day
km	Kilometre
km/hr	Kilometre per hour
km^2	Square kilometre
knots	Wind speed
ktCO2e/month	Metric kiloton of CO_2 emissions per month
kts	knots
L	Litre
L/day	Litre per day
L_E	Accumulated sound exposure level
Lux	Illuminance
PK	Peak sound pressure level
m	Metre
ms^{-1}	Metre per second
m^2	Square metre
m^3	Cubic metre
m^3/day	Cubic metre per day
mg/L	Milligram per litre
mg/m^2	Milligram per cubic metre
mg/m^3	Milligram per square metre
mm	Millimetre
MMscf	Million standard cubic feet
Mt CO_2-e	Metric tonnes of CO2 emissions
MW	Megawatt
nm	Nautical mile
pp	Per person
pp/day	Per person per day
ppb	Parts per billion
ppm	Parts per million
SEL24h	Accumulated sound exposure level over 24 hours
t	Tonne

12. Acronyms

Acronym	Definition
AAD	Australian Antarctic Division
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABC	Australian Border Control
ABN	Australian Business Number
ABS	Australian Bureau of Statistics
ABU	Australian Business Unit
ABWMR	Australian Ballast Water Management Requirements
ACAP	Agreement on the Conservation of Albatrosses and Petrels
ACT	Australian Capital Territory
ADF	Australian Defence Force
ADIOS	Automated Data Inquiry for Oil Spills
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AHO	Australian Hydrographic office
AHTS	Anchor handling tug supply and tow support vessels
ALARP	As Low as Reasonably Practicable
AM	Acoustic Monitoring
AMMC	Australian Marine Mammal Centre
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANSI	American National Standards Institute
ANZECC	Australian and New Zealand Environment and Conservation Council
API	American Petroleum Institute
APP	Air Pollution Prevention
APPEA	Australian Petroleum Production and Exploration association
AQIS	Australian Quarantine Inspection Service
ARC	AMSA Rescue Centre
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AUV	Autonomous Underwater Vehicle
BIA	Biologically Important Area
BIAS	Biologically Important Areas
BOM	Bureau of Meteorology
BOP	Blow-Out Preventer
BRS	Bureau of Resource Sciences
BSCZSF	Bass Strait Central Zone Scallop Fishery
CSS	Capping Stack System
CGS	Shark Gillnet Sub-Sector
CH_4	Methane
CHN	Casino, Netherby, Henry
CM	Control Measure
CMP	Conservation Management Plan
CMT	Crisis Management Team

CO_2	Carbon Dioxide
CoA	Commonwealth of Australia
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea 1972
COVID	Coronavirus
CPUE	Catch per Unit Effort
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSS	Capping Stack System
CTS	Commonwealth Trawl Sector
DAFF	Department of Agriculture, Fisheries and Forestry (Cwth)
DAWE	Department of Agriculture, Water and the Environment
DAWR	Department of Agriculture and Water Resources
DCCEEW	Department of Climate Change, Energy, the Environment and Wate
DEECA	Department of Energy, Environment and Climate Action
DELWP	Department of Environment, Land, Water and Planning
DEWHA	Department of the Environment, Heritage, Water and the Arts
DEWNR	Department of Environment, Water and Natural Resources
DISER	Department of Industry, Science, Energy and Resources
DNA	Deoxyribonucleic Acid
DNP	Commonwealth Director of National Parks
DNRET	Department of Natural Resources and Environment Tasmania
DoA	Department of Agriculture
DoD	Department of Defence
DoE	Department of the Environment
DoEE	Department of the Environment and Energy
DP	Dynamic Positioning
DPAW	Department of Parks and Wildlife
DPI	Department of Primary Industries
DPIPWE	Department of Primary Industries, Parks, Water and Environment
DPIRD	Department of Primary Industries and Regional Development
DSE	Department of Sustainability and Environment
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EAAF	East Asian - Australasian Flyway
ECCBIL	East Coast Cape Barren Land Lagoons
EEZ	Exclusive Economic Zone
EIA	Environmental Impact assessment
EMBA	Environment that May Be Affected
EMT	Emergency Management Team
ENVID	Environmental Impact Identification
Environment Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Environment Regulations)
EOC	Emergency Operations Centre
EP	Environment Plan
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act 1999
EPO	Environmental Performance Outcome
EPS	Environment Performance Standard

ER	Emergency Response
ERA	Environmental Risk Assessment
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESD	Ecologically Sustainable Development
ESTF	Eastern Skipjack Tuna Fishery
ETBF	Eastern Tuna and Billfish Fishery
FDA	Food and Drug Administration
FMP	Fauna Management Plan
FRDC	Fisheries Research and Development Corporation
GAB	Great Australian Bight
GABTS	Great Australian Bight Trawl Sector
GHG	Greenhouse Gases
GVP	Gross Value Product
HAZID	Hazard Identification
HAZOP	Hazard and Operability Analysis
HF	High Frequency
HFO	Heavy Fuel Oil
HMAS	Her Majesty's Australian Ship
HSE	Health, Safety and Environment
HSEMS	Health, Safety and Environment Management System
IBA	Important Bird Area
IBRA	Intermin Biogeographic Regionalisation for Australia
IFC	International Finance Corporation
IMAS	Institute for Marine and Antarctic Studies
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organisation
IMS	Invasive Marine Species
IMT	Incident Management Team
IOGP	International association of Oil and Gas Producers
IPA	Indigenous Protected Area
IPCC	Intergovernmental Panel on Climate Change
ITOPF	International Tank Owners Pollution Federation
IUCN	International Union for Conservation of Nature
JASCO	Jasco Applied Sciences
KEF	Key Ecological Feature
L_E	Equivalent Sound Level
LF	Low Frequency
LGA	Local Government Area
LOC	Loss of Containment
LOWC	Loss of Well Control
LWD	Logging While Drilling
MARPOL	International Convention for the Prevention of Pollution from Ships
MARS	Maritime Arrivals Reporting System
MBES	Multi-Beam Echo Sounder

MC	Measurement Criteria
MCD	Mudline Closure Device
MDO	Marine Diesel Oil
MEMA	Marine Estate Management Authority
MEPC	Marine Environment Protection Committee
MF	Medium Frequency
MGO	Marine gas oil
MFO	Marine Fauna Observer
MNES	Matters of National Environmental Significance
MNP	Marine National Park
MoC	Management of Change
MODIS	Moderate Resolution Imaging Spectroradiometer
MODU	Mobile offshore Drilling Unit
MOU	Mobile Offshore Unit
MPA	Maritime Protection Atlas
MSF	Marine Scalefish Fishery
MSL	Mean Sea Level
MSS	Marine Seismic Survey
N_2O	Nitrous Oxide
NADF	Non-aqueous Drilling Fluid
NE	North-East
NEBA	Net Environmental Benefit Analysis
NEPM	National Environment Protection Measure
NERA	National Energy Resources Australia
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NNTT	National Native Title Tribunal
NOAA	National Oceanic and Atmospheric Administration
NOO	National Oceans Office
NOPSEMA	National offshore Petroleum Safety and Environmental Management Authority
NOPTA	National offshore Petroleum Titles Administrator
NOX	Nitrogen Oxides
NPWSA	National Parks and Wildlife Service South Australia
NSW	New South Wales
NTM	Notice to Mariners
NW	North-West
NWS	North-west Shelf
NZ	New Zealand
OBP	Orange Bellied Parrot
OCNS	Offshore Chemical Notification Scheme
OCS	Offshore Constitutional Settlement
ODS	Ozone Depleting Substance
OEDP	Otway Exploration Drilling Program
OEI	Offshore Electricity Infrastructure
OGUK	Oil and Gas UK
OPEP	Oil Pollution Emergency Plan

OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage (Act 2006)
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Environment Regulations)
OSM	Operational and Scientific Monitoring
OSMP	Operational and Scientific Monitoring Program
OSPAR	Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)
OSTM	Oil Spill Trajectory Modelling
OWR	Oiled Wildlife Response
OWTS	Onshore Waste Water Treatment System
P&A	Plug and Abandon
P&D	Protection and Deflection
PAH	Polycyclic Aromatic Hydrocarbons
PBW	Pygmy Blue Whale
PIRSA	Department of Primary Industries and Regions South Australia
PK	Peak Sound Level
PLONOR	Pose Little or No Risk to the Environment
PMS	Planned Maintenance System
PMST	EPBC Act Protected Matters Search Tool
POB	Persons on Board
PSZ	Petroleum Safety Zone
PTS	Permanent Threshold Shift
QLD	Queensland
RAAF	Royal Australian Air force
RAP	Reconciliation Action Plan
RMR	Riserless Mud Recovery
RO	Reverse Osmosis
ROC	Retailed Oil on Cuttings
ROV	Remote Observation Vehicle
RR	Risk Ranking
SA	South Australia
SBP	Sub Bottom Profiler
SBTF	Southern Bluefin Tuna Fishery
SCAT	Shoreline Clean-up and Assessment Technique
SCE	Solids Control Equipment
SCERP	Source Control Emergency Response Plan
SDS	Safety Data Sheet
SE	South-East
SEEMP	Ship Energy Efficiency Management Plan
SEL	Sound Exposure Level
SESSF	Southern and Eastern Scalefish and Shark Fishery
SETFIA	South East Trawl Fishing Industry association
SFRT	Subsea First Response Toolkit
SGSHS	Shark Gillnet and Shark Hook Sector
SHS	Scalefish Hook Sector
SIMAP	Spill Impact Mapping Analysis Program
SIMOPS	Simultaneous Operations

SIV	Seafood Industry Victoria
SMPEP	Shipboard Marine Pollution Emergency Plan
SMS	Short Message System
SMU	Spatial Management Unit
SMV	Surveillance, Monitoring and Visualisation
SNA	Safe Navigation Area
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SOX	Sulphur Oxides
SPE	Society of Petroleum Engineers
SPF	Small Pelagic Fishery
SPL	Sound Pressure Level
SPRAT	Species profile and threats database
SRL	Southern Rock Lobster
SRW	Southern Right Whale
SSDI	Subsea dispersant injection
SSESF	Southern and Eastern Scalefish and Shark Fishery
SSJF	Southern Squid Jig Fishery
SSS	Side-Scan Sonar
STF	Skipjack Tuna Fishery
SW	South-West
TAC	Total Allowable Catch
TACC	Total Allowable Commercial Catch
TAS	Tasmania
TASPAWS	Tasmanian Parks and Wildlife Service
TD	Total Depth
TEC	Threatened Ecological Community
TSIC	Tasmanian Seafood Industry Council
TSSC	Threatened Species Scientific Committee
TTS	Temporary Hearing Threshold Shift
TVDRT	True Vertical Depth referenced to Rotary Table
UK	United Kingdom
UKOOA	UK Offshore Operators Association
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States
USA	United States of America
USBL	Ultra-short Baseline
UTAS	University of Tasmania
UXO	Unexploded ordnance
VBA	Victorian Biodiversity Atlas
VFA	Victorian Fisheries Authority
VHF	Very High Frequency
VIC	Victoria
VICP	Virtual Incident Command Post
VSP	Vertical Seismic Profiling
WA	Western Australia

WAF	Water-Accommodated Fraction
WBDF	Water-based Drilling Fluid
WCD	Worst case discharge
WDCS	Whale and Dolphin Conservation Society
WECS	Well Engineering and Construction Management System
WET	Whole Effluent Toxicity or wells emergency team
WMO	World Meteorological Organisation
WOMP	Well Operations Management Plan
WSTF	Western Skipjack Tuna Fishery
ZTV	Zone of Theoretical Visibility

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APPENDIX A EIA TOOL

- Introduction and Instructions
- Activity-Aspect Tool
- Aspect-Impact-Receptor Tool
- Commonwealth Legislation
- State Legislation
- International Codes
- Receptor Management Plans
- Other Relevant Guidance
- Cumulative impact Assessment (CIA) Scoping Tool
- CIA Assessment Tool
- Environmental Performance

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX B EPBC PMST REPORTS

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX C CONSULTATION ARTIFACTS

Section 24(b) of the Environment Regulations requires that an environment plan contains a report on all consultations, under section 25, of any relevant person by the titleholder. This report must include the following:

- A summary of each response, and
- An assessment of the merits of objections and claims regarding adverse impacts of activities proposed, and
- A statement of ConocoPhillips Australia's response as titleholder to objections or claims.

Appendix C1: Consultation Report

- The relevant person/organisation ID (that did not request information be maintained as confidential)
  - Their functions, interests, or activities
- Communications
- Summary of each response

Appendix C2: Objections or claims under section 24

- Relevant person ID (Stakeholder ID) (that did not request information be maintained as confidential)
- Objection/claim
- Assessment of merit
- Summary of feedback and response, and measures adopted

Appendix C3: Supplementary Evidence

- In further support of the regulatory requirements, ConocoPhillips Australia has undertaken additional efforts and methods to reach relevant person in the community and raise awareness of the ability to self-identify through various mediums.
- Evidence that is associated with multiple people such as project updates.

Appendix C4: First Nations Consultation

- Communal interest facilitated a tailored, fit-for-purpose method of consultation. Which was adopted to reasonably reflect the characteristics of the interests affected by the proposed activity.

Appendix C5: Commercial Fishers Consultation

- Communal interest facilitated a tailored, fit-for-purpose method of consultation. Which was adopted to reasonably reflect the characteristics of the interests affected by the proposed activity.

Appendix C6: Public Comment Report

- Overview of the process applied to assessing and responding to public comments.

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX D SENSITIVE INFORMATION REPORT

Appendix D: Sensitive Information Part (24(b)(iv))

- To comply with section 26(8) of the OPGGS(E)R, the full text of all responses by relevant individuals engaged under section 25 and any other sensitive information (if applicable) must be included in a sensitive information report.
- This report satisfies the remainder of section 24 and section 26(8) by containing full text responses by relevant persons and any additional sensitive information. This report will not be published.

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.
NOTE: Appendix D is not publicly available and is provided to NOPSEMA only, as it contains confidential information.

APPENDIX E OIL SPILL MODELLING REPORTS

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX F LIGHT MODELLING REPORTS

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX G NOISE MODELLING REPORTS

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX H ZTV MODELLING REPORTS

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX I OIL POLLUTION EMERGENCY PLAN (OPEP)

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX J AIR EMISSIONS ASSESSMENT

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX K UXO CONTAMINATION REPORT

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX L BIOSIS CULTURAL HERITAGE REPORT

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX M CONOCOPHILLIPS' HSE POLICY

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX N FAUNA MANAGEMENT PLAN

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX O DESKTOP MARITIME HERITAGE ASSESSMENT

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.

APPENDIX P CETACEAN SURVEILLANCE PROGRAM

Full Appendices are located in a separate document which can be found on NOPSEMA's website for Project RMS ID: 7618.